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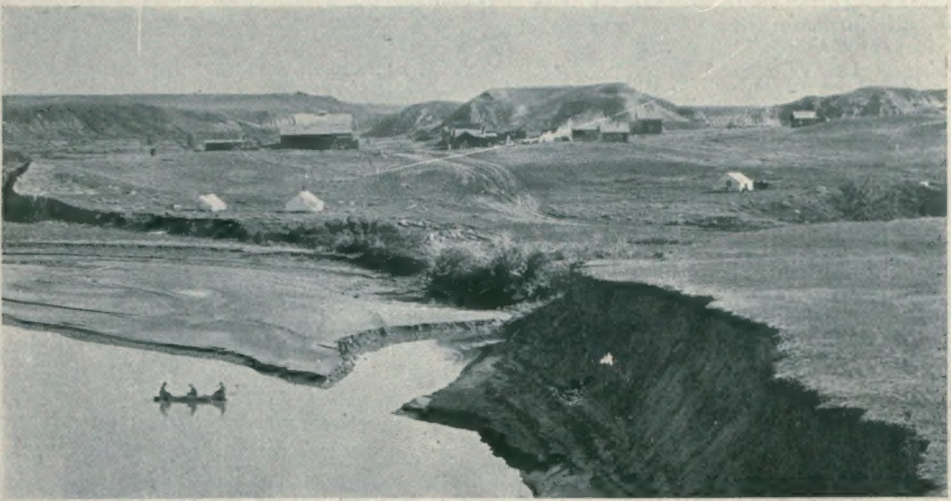

Wanted! A few groves of trees for wind-shelter, for beauty, for fuel. Scene taken at Steveville, Red Deer Valley, Alberta.

Why the Prairies are Treeless

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1/9/22

By R. H. Campbell
Director of Forestry, Ottawa

The chief onus of blame laid at the door of fire.

IN the western part of the North American continent and mainly to the east of the Rocky Mountains is an immense extent of land almost bare of trees, representing the western plains and prairies. Distinction is usually made between the districts represented by the two terms—the term "plains" being confined to the arid tracts destitute of grass and sod such as are found in part of Colorado, in Arizona, in New Mexico, and in Southern California. "Prairies" on the other hand is confined to those great land areas covered by grass and sod which are characteristic of the Canadian western prairies.

In his poem on "The Prairies," William Cullen Bryant describes them as follows:—

"These are the Gardens of the Desert, these
The unshorn fields, boundless and beautiful,
For which the speech of England has no name—
The Prairies. I behold them for the first,
And my heart swells, while the dilated sight
Takes in the encircling vastness. Lo! they stretch
In airy undulations, far away,
As if the ocean in his gentlest swell
Stood still with all his rounded billows fixed,
And motionless forever—Motionless?—
No—they are unchained again. The clouds
Sweep over with their shadows, and, beneath
The surface rolls and fluctuates to the eye;
Dark hollows seem to glide along and chase
The sunny ridges."

So far as I am aware, the question of why the Canadian prairies are generally treeless has not been given exhaustive scientific investigation. Theories have been put forward incidentally from time to time by different men from the viewpoint of special conditions they had in mind at the time, but these seem to be more in the nature of flashes struck off at high pressure in the consideration of some special condition instead of the statement of and the result of careful conclusions resulting from long and attentive study and balancing of all possible influences. For indication of the various theories on the subject therefore it is necessary to refer to studies made and publications issued in the United States of America.

Reference to such studies and publications shows that the following theories as to the causes have been supported by various authorities.

Is the Soil Responsible?

One theory is that put forth by Professor J. D. Whitney in his book "Plain, Prairie and Forest," who pointed out that the forests as a rule occupy gravelly or open soils and avoid the fine deep sediments, and from that argued that the prairies are treeless because their soil is too fine and close to properly nourish the roots. This theory is not however thoroughly well based. As a matter of fact, there are all varieties of soil throughout the prairies, and trees have been grown successfully on the Canadian prairies in practically all conditions of soil.

Another theory proposed by J. W. Redway is that the prairies occupy an ancient inland sea and never were forested, but this theory is uncertain and is insufficient considered alone, to allow for the present existence of bluffs of trees and of fringes along streams throughout most of the prairie region.

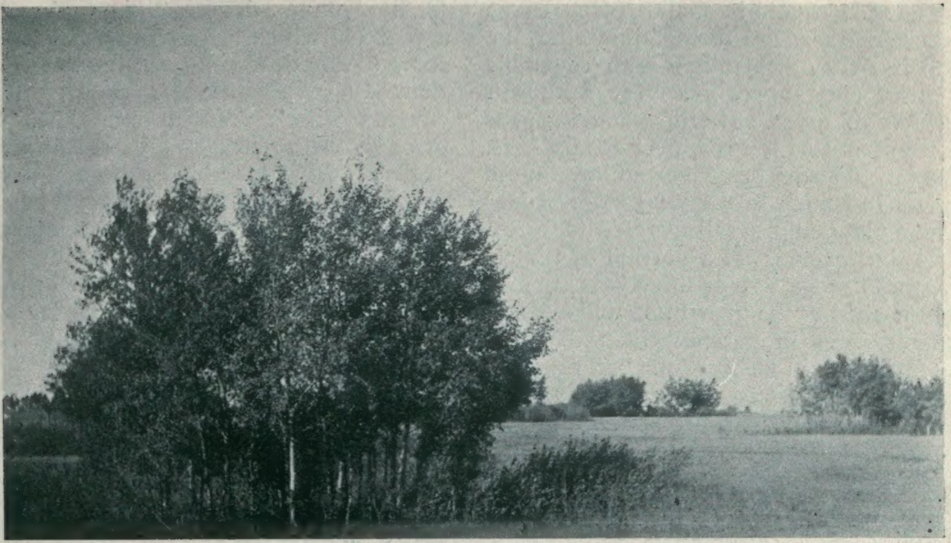
It is also suggested that the trees were driven out during the last glacial period, but this is also rendered untenable by the fact of trees being scattered here and there on the prairies as indicated in the last paragraph, and by the extensive forested areas to the north of the prairies.

The claim was also made that the close prairie sod is a barrier to the establishment of tree growth and this claim is to a large extent true. Thorough cultivation of the soil is generally found to be a necessary preliminary to the establishment of a tree plantation. This however does not seem a sufficient explanation of the vast extent of treeless prairie as in favorable seasons and conditions the trees begin to creep out on the prairie.

Insufficient Rain?

The theory has also been advanced from several directions that the treelessness of the prairies is the result of insufficient rainfall. While this is undoubtedly true of the arid plains in the south western states it is not in itself a sufficient cause for the lack of trees on the Canadian prairies. The precipitation is cerainly lighter than in the forested districts but is generally sufficient to support tree growth where it exists on the prairies.

"Chinook" winds have also been suggested as a reason for the treelessness of the prairies but this cause by itself does not seem to be sufficient. The warm chinook winds in winter often cause the formation of ice on the ground and, if long enough continued may, especially towards spring, start growth which will be destroyed by the inevitable return of winter weather. Some species of trees that succeed well in Manitoba and Saskatchewan cannot stand the effect of the Chinook winds in Alberta where their influence is more marked than farther east.



Trees taking possession of the prairie north of Oxbow, Saskatchewan. Thirty years ago the land covered by the photograph was totally bare.

The denudation of trees from the prairies has also been ascribed to prairie fires and as the struggle between prairie and forest has been studied in the debatable land just west of the Mississippi, where the prairies have in comparatively recent times been clearly extended by fires, the conclusion has been reached that this element must be given a large place in the accomplishment of the result of formation of prairies. It is found that the border lines between prairie and forest are very irregular. The prairies stretch into the forest land in long tongues in the shapes in which they would occur if caused by fires.

Our Prairies Once Tree Covered.

Turning now to Canadian conditions it seems quite clear that in remote geologic time the districts which are now prairie were covered with heavy forest. In southwestern Manitoba and southern Saskatchewan extensive beds of lignite coal are found, and good coal exists throughout Alberta up to and into the Rocky Mountains, and is largely mined. This fact seems to establish definitely that at one time extensive forests existed in the prairie districts, though generally of species of trees not now existing in the territory.

So far as the theory that treelessness results from the country having been an inland sea is concerned it may be pointed out that a great part of southern and central Manitoba was for a long time covered by a great lake, Lake Agassiz, which followed the glacial epoch. But the area which was included in this lake carried the forest which lay along each side of the Assiniboine River and the well wooded district west of Lake Manitoba and around Lake Winnipegosis so that it is not entirely treeless. West of the Pembina Ridge and the Brandon Hills was another lake, Souris Lake, covering what is now south western Manitoba and eastern Saskatchewan.

Thus in a report made in 1859 by Professor H. Y. Hind, Professor of Chemistry and Geology at Trinity College, Toronto, the following statement is made:

"Putting out fire in the prairies is a telegraphic mode of communication frequently resorted to by Indians. Its consequences are seen in the destruction of the forests which once covered an immense area south of the Qu'Appelle and Assiniboine. The aridity of those vast prairies is partly due to this cause. The soil, though light, derives much of its apparent sterility from the annual fires.

In low places and in shallow depressions where marshes are formed in spring, the soil is rich, much mixed with vegetable matter, and supports a very luxuriant growth of grass. If willows and aspens were permitted to grow over the prairies, they would soon be converted into humid tracts in which vegetable matter would accumulate, and a soil adapted to forest trees be formed. If a portion of prairie escapes fire for two or three years the result is seen in the growth of willows and aspens, first in patches, then in large areas, which in a short time become united and cover the country; thus retarding evaporation and permitting the accumulation of vegetable matter in the soil. A fire comes, destroys the young forest growth and establishes a prairie once more. The reclamation of immense areas is not beyond human power. The extension of the prairies is evidently due to fires, and the fires are caused by Indians, chiefly for the purpose of telegraphic communication, or to divert the buffalo from the course they may be taking."

Professor John Macoun in remarks made before a meeting of the Canadian Forestry Association in 1902 made the following statement:—

Prof. Macoun's Verdict.

"The whole of the land in the Northwest was made prairie by fire, with the exception of a few square miles. There is wood at Turtle Mountain, Moose Mountain, Wood Mountain, Cypress Hills, West Butte and Three Buttes. These hills are not high, but they are more or less covered with wood, and when you examine them you find the country is undulating, with ponds and lakes in the hollows. These ponds prevented the destruction of the timber, but when the fires got away from the hills on to the level land they could not be stopped. The fire burnt on and left a margin of burnt timber and grass, and next year the fires started afresh, and the result was when the fires were stopped two hundred miles north of the Saskatchewan, there was a margin of burnt trees always to the south, and outside of that margin a margin of young trees growing up out of the grass, and still farther you would find little poplars of a year old which had sprouted from the roots of the dead ones, so that it is evident the whole of that country was covered with forests at one time, but through the agency of fires it became a prairie. What is to hinder it from being covered with timber again? What is needed is water. I make that statement —it may be contradicted, but in later years, after I am dead, it will be proved. The land is there and all that is required is water to make it grow anything."

While the geological record is not sufficiently complete, or has not been sufficiently studied with that object in view, to establish what condition or catastrophe is primarily responsible for the treelessness of the prairies, it would seem reasonable that, after the upthrust of the Rocky Mountains and the consequent interruption of moisture laden winds from the Pacific Ocean, the climate of the prairie districts became much dryer and this and subsequent forest fires gradually and steadily reduced the forest area and extended the prairie till finally it stretched unbroken for hundreds of miles from west to east.

The Example of C. S. Noble.

Mr. C. S. Noble, owner of the largest farm in Canada, 35,000 acres, at Nobleford, near Lethbridge, Alberta, is planning to put 82 acres into trees next Spring.

Mr. Noble has made a remarkable record. Twelve years ago he arrived at the site of Nobleford with $1,000—and plenty of imagination and muscle.

This year, one field alone, planted to wheat, measured 9,000 acres, and averaged forty bushels to the acre. Fifty-six binders were cutting at one time. The total yield of the Noble farm this year exceeds in value $1,250,000.

It is not surprising that Mr. Noble is likewise a leader in establishing small woodlands as a balance-wheel to his great estate.

Wood and Its Distillation

The first of a series of articles by Dr. Alfred G. Macintyre, Ottawa

THE importance of forest reserves was fully illustrated during the recent war and it may be accepted that these, in the future, will be considered one of the "key" resources which must be built up and conserved for any untoward possibilities which may arise.

Early in the war a large number of scientific and technical men predicted that, with a good blockade, the Central Powers could not continue the war for more than twelve months, because, by that time, their enormous reserve of cotton, for the manufacture of smokeless powder, would then have become exhausted and they would have no further supply of raw material to produce the necessary propellant powder.

Such persons were evidently unfamiliar with the fact that, as early as 1909, one of the German Imperial powder factories had made excellent smokeless powder by the substitution of the cellulose of wood pulp for that of cotton and thus, when the supply of the latter was cut off, the explosion factories had recourse to the employment of wood-pulp manufactured from their 25 million acres of forest reserves. The Central Powers, as a result, did not suffer through lack of raw material for making propellants and carried on, in this way, with an ample supply until crushed by other means than the cotton blockade.

Besides the pulp industry there exists another important "key" industry associated with forestry products namely: that of the distillation of wood. The acetone necessary, as a solvent, in the manufacture of cordite, in pre-war times, was solely made from acetate of lime, a product of the destructive distillation of hardwoods. The acetic acid and acetates required for aeroplanes and such like were also obtained in the same way. It is true other methods of preparing these substances were developed, owing to the great shortage, but most of them ceased to be employed as soon as the war ended.

Charcoal an Ancient Product.

No one can say when and where the first primitive method was introduced for the manufacture of charcoal from wood, but it is certain that this substance was made more than 5,000 years ago. The same uncertainty exists regarding the place and date of the first recovery of the condensable gaseous products obtained by the charring of wood. It is probable that it commenced with experiments at the early part of the 18th century, carried out by the phlogistonists in an endeavour to separate the "active spirit" of wood. The earliest British works, for the distillation of wood and recovery of the pyroligneous acid, were erected between 1790-1800 and these existed in connection with the supply of charcoal for the metal industries of the districts of Sheffield and Glasgow, and the production of acetic acid and acetates for the dyeing and calico printing industries. The Scottish works date from the beginning of the nineteenth century and are interesting for two reasons: first, that some of the original factories are operating under the same firms today, and second, that these works sent forth the pioneers who built up this industry on the American continent. Messrs. Turnbull, of Glasgow, who have possessed, at different times, a considerable number of works in Scotland and Ireland, built a plant early in the last century on a small brook called the "mill burn" which flows into the river Leven just south of the town of Alexandria, Dumbartonshire, and it became known as the "Millburn" works. This firm, in 1848, decided to build a plant in America, and early in 1849 men and material were sent from Scotland, the workers largely from Millburn to a site near Binghampton, New York, to erect and operate a factory. The place received the name of Millburn from the home works. This was the first plant for the distillation of wood in America and from it developed the industry in the United States which today comprises 100 factories with a total capacity of consuming more than one million cords of wood per annum.

Canada's First Factory.

The first plant for the distillation of wood in Canada was not that erected at Fenelon Falls, Ontario, in 1897 as has been repeatedly stated, but was the one built at Anagance, Kings county, New Brunswick, in 1880 and operated until 1886. It consisted of seven iron retorts and manufactured gray acetate of lime, methyl alcohol and charcoal. The retorts and also the first supply of stills, were imported from Scotland.

There are about thirteen factories in Canada engaged in the distillation of wood and these consume about 130-140,000 cords of wood per annum and produce, approximately, 13,000 tons of gray acetate of lime, 60,000 tons of charcoal and 1,000,000 gallons of methyl alcohol. These may be termed the prime products of these factories. In eastern Canada hardwoods are exclusively employed, and the greater percentage being birch, beech and maple. Preference is given hardwoods, for distillation, because the yields of acetic acid and methyl alcohol are higher, compared with that obtained from softwoods, and the distillates are more easily refined. With the increasing demand and higher prices offering for some of the products of the distillation of soft woods, more attention is being directed to the possibility of utilizing these woods in America.

Dry wood is chiefly composed of carbon, hydrogen and oxygen and the quantities of each calculated to ash and nitrogen—free wood, averages about 50 per cent. carbon, 6.2 per cent. hydrogen and 43.8 per cent. oxygen. The nitrogen content of wood varies between 0.05 and 1.5 per cent. Spruce contains 0.05-0.10 per cent.

Cellulose in Wood.

The chief constituents of wood are cellulose, lignin and carbohydrates. The percentage of cellulose, in general, is in the vicinity of 50-60 per cent. There is about 25-28 per cent of lignin in soft woods and 20-26 per cent in hardwoods. The carbohydrates, in the form of pentosanes, vary from 10-13 per cent in soft woods to from 22-26 per cent in hardwoods. The percentage of hexosanes also differs with various kinds of wood. The general composition of wood varies with locality of growth, age and different parts of tree.

The chemical structure of the cellulose molecule, the principal constituent for pulp manufacture, has not as yet been determined. Many theoretical structures have been proposed but all are hypothetical. The average chemical composition of cellulose is 44.4 per cent. carbon, 6.2 per cent. hydrogen and 49.4 per cent. oxygen. It would appear as if cellulose, from different sources, were not a chemically individual compound, but rather a generic application for very similar compounds. This is indicated by the yield of acetic acid obtained, under the same conditions, from the various celluloses.

The following is the respective percentages of acetic acid from the cellulose of cotton, spruce, birch and beech—1.4; 2.8; 3.9 and 3.5 per cent. The structure of the lignin molecule is equally as uncertain as that of cellulose. The composition of socalled lignin varies between 56.-60. per cent. of carbon and approximately 5.8 per cent. hydrogen and 38.0 per cent oxygen, much depending upon the degree of purity. The lignin molecule contains at least four methyl or methoxy groups which are important in the distillation of wood as sources of wood alcohol, while cellulose and carbobohydrates are members of what is known as the aliphatic series, lignin is generally accepted as belonging to the cyclic compounds, and possibly containing an aromatic nucleus. There are those, reasoning by analogy and certain degradation products, who view lignin as a condensation product of coniferyl alcohol, a substance found combined with glucose in the form of the glucoside coniferin, in the cambial sap of trees. Others entertain the opinion that it is a cyclic hexenone united through acetyl residues with a pyrone ring compound containing methoxy-groups. This latter contention has some experimental evidence supporting it, but does not explain the many degradation reactions of lignin.

A great deal more is known of the

carbohydrates—pentosanes and hexosanes—particularly products of their respective hydrolysis—pentoses and hexoses. The bark of the coniferae, and to some extent that of the deciduous woods, contains tannin associated with a large percentage of substances called "nontans" including carbohydrates, such as glucose, etc. Tannic acid is a member of the aromatic (cyclic) series, and the tannin obtained from barks is generally classed as belonging to one or both of the following groups—pyrogallol and catechol. Derivatives of these compounds are found among the degradation products formed by the distillation of wood, and in a measure the presence of these substances explain the hypothetical contention that lignin is built up from coniferyl alcohol and besides the analogy between the bark and lignified wood.

The chemist, in considering the products of the distillation of wood, has his attention almost entirely directed to the substances formed by the pyrogenic degradation of cellulose, lignin and carbohydrates which constitute his raw material and the conditions most favorable for the highest yields of the economic products which he desires to obtain from his wood. Some of the methods and results will be the subject of future communication.

New York to Alberta by Wing.

From New York State wild ducks drift north-westward to Alberta, according to the inscription found on a band on the leg of a pintail shot on the outskirts of Camrose, Alberta, recently. The inscription bore the wording: "Released by the American Museum at New York. Will the finder of No. 35793 please notify us." Carl Jensen, who shot the bird, is communicating with the museum authorities and is having it mounted.

Roughly speaking, it would be about 2,500 miles from New York to Camrose. The discovery of the New York bird so far north-west will open up a new field of speculation as to the wild ducks' migratory habits.

Daylight Encouragements

Books are night birds. Most printing reaches the ultimate consumer by lamplight. Only school books, directors, telephone books, maps and telegrams are read by daylight.

So says Dr. Frank Crane. The doc slights the newspaper writers, however, in overlooking the fact that some of the most impressive literature we get reaches us in the morning mail to brighten up the day and encourage us in our work. It generally concludes with a jovial threat to take the usual legal proceedings if not attended to within a specified date.—Ottawa Citizen.

The Rats-and-Matches Theory

In the lengthy category of reasons and excuses for fires, that of friction due to the gnawing of match heads by rats and mice has had to bear its full share. When all else could prove an alibi the rats were blamed. The increasing number of fires attributed to this cause emphasized the necessity of establishing the possibility of it being bona fide.

The Underwriters' Laboratories, Inc., of Chicago, after careful and prolonged experiments by its fire prevention engineers, has reached the definite conclusion that rats would rather starve to death than eat the modern match heads.

Match Concern Reforests

Bryant & May, a big British match firm, have purchased a large estate in Scotland and are reforesting land to supply their own wood for the making of matches. The land secured is at present quite bare, the tree chosen is the aspen, and it will be thirty years before the firm manufacture the first matches from the new supply.

A Subscriber's Opinion.

I am delighted with your Forestry Magazine, and am pleased to be a member of the Forestry Association. Being a wood ranger myself, you can imagine how these articles appeal to me.

Wishing the association every success,

H. J. D. HAMMOND,
Dryden, Ont.

A Policy Where All Opinions Meet

IN both Canada and the United States it has long been recognized that progress in the administration of the forest resources, whether publicly or privately owned, must be along the lines of co-operation and compromise. While in this country, the 'way out' will probably be found through the machinery of the provincial governments which are the chief timber owners, the American plan as now evolved under the name of "A National Forest Policy" gives leadership and authority to the Federal Government in carrying out a nation-wide plan which eventually would provide an adequate timber supply for the people of that country. It is well to bear in mind, also, that four-fifths of the timber lands of the republic have been alienated from public control while in the Dominion exactly the reverse of this condition obtains. Not more than ten or fifteen per cent. of the total timber area of Canada has been deeded to private ownership.

After long negotiation final agreement was reached between representatives of the American Paper and Pulp Association, National Lumber Manufacturers Association, National Wholesale Lumber Dealers Association, the Association of Wood-using Industries, the American Forestry Association, American Newspaper Publishers Association, the United States Chamber of Commerce and the Chief Forester of the United States. In the legislation proposed, authorization is given to the Federal Secretary of Agriculture to approve proper state policies covering fire prevention, reforestation and, where necessary, the cutting and removing of timber crops. Other clauses call for:

A survey to obtain necessary information as to forest resources, forest production and forest requirements of the nation.

Provision for studies and experiments in forest reproduction methods, wood utilization, timber tests, wood preservation, development of by-products and other steps to bring about the most effective use of the nation's forest resources.

Provision for more rapid replanting of the vast areas of denuded lands within the National Forests.

Appropriation of ten million dollars a year for five years for the purchase of lands which should be added to the National Forest system, whether or not on the headwaters of navigable streams as such purchases are now limited.

Authorizing acquisition of similar lands by exchange of land or timber when clearly in the public interest.

Authorizing the addition to National Forests of lands now in other forms of government ownership but found chiefly suitable for permanent forest production.

It is contended that a National Forest Policy should observe the following principles and provisions:—

1. That all soil shall be made productive of the crop to which it is best adapted or for which there is the greatest public need.

2. That while agriculture and forestry are based upon soil production, the methods necessary in forestry and the time involved are so different from those of agriculture that forestry demands an entirely different form of administration.

3. That State Forest Policies shall be initiated and carried out in co-operation with the National Government and with private owners wherever and to the fullest extent possible.

4. That State Forest Legislation shall establish general principles and procedure only and vest in a properly constituted and non-political body, acting through technically qualified representatives, the responsibility for the fixing of regulations and enforcing them.

5. That the paramount and immediate consideration in any Forest Policy is the creation and maintenance of effective means for the prevention and control of fire on all forest lands of whatever ownership, and that every owner of forest land shall be required to conduct operations thereon in such a manner as to avoid creating a fire menace to adjacent property.

6. That forest surveys, land classification, forest research and forest education shall be provided for.

7. That there shall be such changes and adjustments in prevailing systems of taxation as will enable all forest lands to be equitably taxed thereunder, yet will not discourage the holding of private forest land for future crops without impairing local revenues.

8. That the state, upon request, shall assist the private owner of forest lands to make them continuously productive through the preparation of working plans, supplying of planting material and supervision of silvicultural operations free of charge or at cost.

9. That the state be empowered to take over at a fair valuation and administer as part of the system of public forests any land, which, after competent examination, is classified as suitable only for timber growth, in case the owner refuses to avail himself of the opportunities and assistance provided by the public to encourage forestry upon private lands.

10. That the acquisition of forest land by the state is essential to a sound forest policy.

11. That all state-owned forests shall be utilized for continuous production, both for direct returns in forest products and indirect returns in soil protection, game and recreation.

12. That all state-owned forest property shall be capitalized upon the records of the administrative body so that all expenses in connection with the development thereof and returns therefrom may be accounted for on a business basis to the people of the state who furnish the funds for the undertaking and enjoy its results.

Paper Textiles Make Headway

IN Chambers' Journal Frederick A. Talbot combats the still popular idea that paper textiles were a product of the war, doomed to disappear with the return of normal conditions. He declares that paper is capable of seriously challenging "the supremacy of generally accepted textiles, such as woll, cotton, linen, silk, hemp and jute." There will be a struggle for supremacy, he thinks, between the paper products of Britain and Germany. "We have entered the paper textile age,' he says, "and the future of the trade on these islands is amply secured."

In his enumeration of the fabrics which can be and are being made from paper, Mr. Talbot gives a surprisingly long list in addition to the various uses to which it was put in war- time exigencies. To quote:

> "It provides excellent material for bootlaces, braiding, webbing and belting, being not only stronger than the ordinary materials therefor, but having the additional advantage of being fireprof and waterproof, so that it will neither contract with damp nor stretch with dryness. It is a first-rate insulator, and is employed for insulating, flexible electric wire. It makes a capital stair carpet, while any desirable pattern and coloring can be obtained in the weaving. It not only offers a good upper for tennis and other shoes where canvas or jute is ordinarily employed, but can be used for soling purposes as a leather substitute with every success. It is an excellent art fabric for covering walls. , . At the moment it is being exploited for the production of art carpets, and in this respect holds out many inducements."

Lace curtains and table cloths that can safely be laundered, scrubbed and boiled are included in the list. The English speaking world laughed at the Germans and their paper clothes, but apparently paper textiles are to play a part in the industry and life of every nation beyond all previous imagining.

Courtesy American Forestry Association.

The Great Red Plague of Canada: One million square miles of our national forests already fire-swept, and fresh areas are added each year. These forests grew on non-agricultural soil—nearly every acre of which is owned by the State—upon which no crop except timber ever can be produced.

There is a way open to every Canadian citizen to revolutionize conditions that permit this stupendous public waste; membership in the Canadian Forestry Association. Your personal influence is multiplied a hundred fold by joining hands with 12,000 of your fellow-Canadians towards a common patriotic object.

Ontario's Plans for a Tree Supply

THE Provincial Forester for Ontario reports it is expected the Government nurseries will be able to handle any requests for young trees during the coming season. The nurseries at St. Williams, Ontario, are doing very well, and they will be able to produce trees in very large quantities within the next year. Great difficulty has been experienced in securing forest tree seeds, especially those of the Red or Norway Pine. Suitable Scotch Pine seed has not been obtainable from Europe, and the Provincial Forestry Department have doubted the wisdom of going too heavily into White Pine until the status of White Pine disease is settled. The seed of the White Pine and White Spruce, however, has been obtainable in sufficient quantity for the coming season. The Department hopes to import the other seed needed, and expects a heavy stock within the next two years.

The Secret of Preventing Forest Fires

AT the request of the Canadian Forestry Magazine, Mr. H. Sorgius, Manager of the St. Maurice Forestry Protective Association, with headquarters at Three Rivers, P.Q., made the following statement as to his experience concerning the value of educational work in heading off the forest fire plague. Mr. Sorgius has one of the best organized forest protective systems on the continent, and speaks as one who has at his disposal every mechanical means of patrol and fire fighting and yet places his chief reliance on educational method. Says Mr. Sorgius:

"I can say that I am more than ever convinced that the chief method to be used in forest protection is a serious campaign of propaganda, and more money should be spent in educating the people to prevent forest fires. Through the experience and data obtained by this Association since 1912, it is proven that outside of a very small number of fires caused by lightning and fires caused by railway locomotives, all fires could be prevented. It is far more essential to prevent forest fires than to detect and extinguish them. I would suggest that greater effort should be made in educating the people, especially those whose work is in connection with the lumbering operations, also the fisherman and hunter.

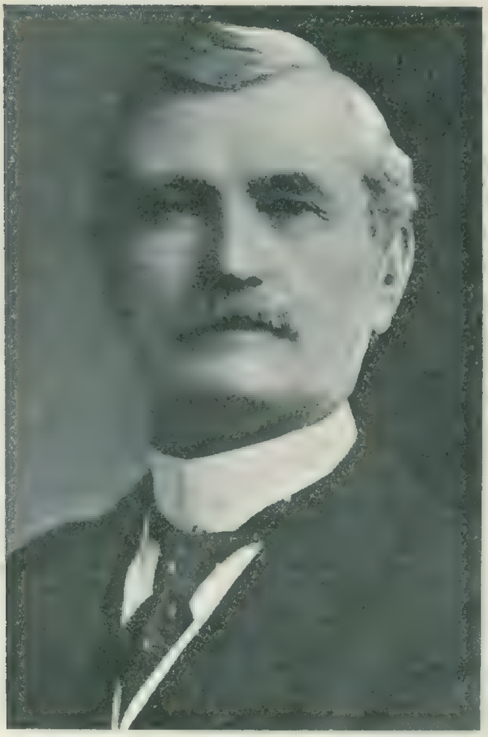
"The settlers in our territory during past season caused four fires, burning an area of only 19 acres. We have no trouble whatever through this source, and the good results, we believe, were obtained through the educational efforts carried on by this Association since several years. It will be remembered that only a few years ago the settlers were the cause of 100 to 185 fires a year and damaging large areas, and this, we believe, is sufficient proof to show the value of publicity in forest protection."

Sault Ste Marie, Ont.

Can. Forestry Magazine:

I enclose with pleasure cheque to cover 1920-21 for Magazine. It is the best value of any publication I receive. You are doing a splendid work in endeavoring to educate Canadians in the value of their timber heritage, for many still do not appreciate the worth of a growing tree.

Wishing you every success,
(Sgd.) L. A. GREEN.



Death of William Power.

In the passing of William Power, of Quebec, the Canadian Forestry Association loses a valued Director and a firm friend.

Mr. Power was President of the firm of W. and J. Sharples, timber merchants, Quebec, President and one of the principal owners of the River Ouelle Pulp and Lumber Company (recently changed to the Power Lumber Company), and President of the Lafontaine Lumber Co.

Born at Sillery, February 21st, 1848, a son of the late William Power, one of the managers of W. and J. Sharples, Mr. Power took his education at the Sillery Public Schools and the Quebec Commercial Academy, and in 1860 entered the business with which his father was associated and became a partner in 1906. In 1902 he was elected to the House of Commons for Quebec West bye election and re-elected at the general election of 1904. He engaged in many public activities, serving as a President of the Quebec Board of Trade and giving his time to such events as the Tercentenary Celebration. In 1914 Mr. Power was elected President of the Canadian Forestry Association, and never hesitated to devote himself whole heartedly to the advancement of its objects.

He is survived by his widow, formerly Miss Winifred Rockett; four sons, W. Gerard Power, of St. Pacome; Joseph Power, Charles G. Power, M.P., and Frank Power, of Quebec; two daughters, Mrs. Noel Barclay, of Montreal, and Mrs. F. A. Mosely, of Montreal, as well as two sisters, the Misses Alice and Annie Power, of Bridgewater Cove, Sillery.

BIND YOUR 1920 COPIES

Those wishing a title page and index for 1920 Can. Forestry Magazine should write at once to the office of publication, 224 Jackson Building, Ottawa, for a post-free copy.

Lumbermen and Pulp Manufacturers Attention!!

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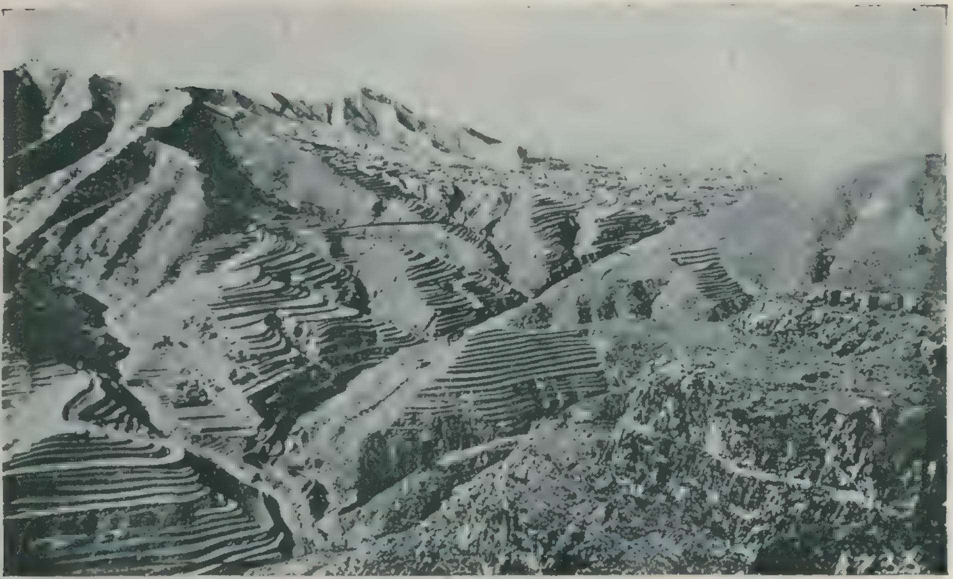


The price that nature demands for forest destruction: with the hillsides robbed of all traces of tree cover, the erosion of the soil, which was an inevitable result, compelled the wretched population to laboriously terrace the slopes to hold the soil in place. Many "farms" have just enough fertile earth to carry two rows of corn.

China Pays the Price of Ruined Forests

by Bailey Willis, U.S. Geological Survey

CHINA, like other long innabited lands, has been deforested wherever the condition of climate or topography are not such as to make it impossible to destroy the forest. In this respect the empire divides naturally into a southern region on the one hand, in which semi-tropical conditions of rainfall and temperature are exceedingly favorable to vegetation, so that shrubbery and trees have renewed themselves wherever there is opportunity; and on the other hand, northern China, where severe winters and limited rainfall are unfavorable to growth, and the great need of mankind for fuel has rendered his destructive activity especially effective.

In Central China there lies between the north and the south a great mountain range, 8,000 to 12,000 feet in altitude and approximately 300 miles across, which, stretching east and west, separates provinces as distinct as are those on opposite sides of the Cascade Range in Washington. In this great mountain range, the Ts'in-ling-shan, there is a meeting of the vegetation of the temperate and semi-tropical zones. In the more southern and lower valleys one finds the bamboo, growing in a single season to heights of 30 and 40 feet, the Chinese sumac or lacquer tree, and varieties of the araucarian pine, together with many trees and shrubs unfamiliar to an American; but ascending the mountains, one passes up into extensive coniferous forests, where trees as much as five feet in diameter and perhaps 200 feet tall may still be found. One would scarce perhaps credit the primitive methods of lumbering employed by the Chinese, with ability to destroy the forests of a densely grown mountainrange, but such is the case. Along the more accessible foothills, shrubbery or bare hillsides replaced the forest which we were told flourished there within forty or fifty years. Villages, whose prosperity had depended upon the lumbering industry, contained many deserted houses, which, in their ruinous condition, reminded one of an abandoned lumber camp of our own Northwest; and the steep slopes from which the soil was rapidly being washed in deep, red gullies told how recent had been the removal of the protective forest cover. Yet here the only implements of destruction are a primitive axe and saw, and the only means of transportation for the lumber is men's backs. The trees are commonly cut with a small axe, and are sawed with a whip-saw into boards two and a half to three inches thick, with an average length of eight feet. Three or four such boards make a man's load, and are carried out, it may be a journey of ten days or two weeks, over the roughest mountain trails, by men whose average day's journey is ten to fifteen miles, and who crawl over the path, steadying themselves under a load of 180 to 200 pounds by carrying in each hand an iron-shod pole. The use to which these boards are put is limited to the single purpose of making coffins. Usually an entire coffin, consisting of a top, bottom, two sides and ends, all shaped and hewn to be put together, makes two men's loads. Small logs, which are used for house building and other purposes, are sometimes run in streams, and the Chinese then use a stout canthook and methods not unlike those of our own lumbermen in mountain regions.

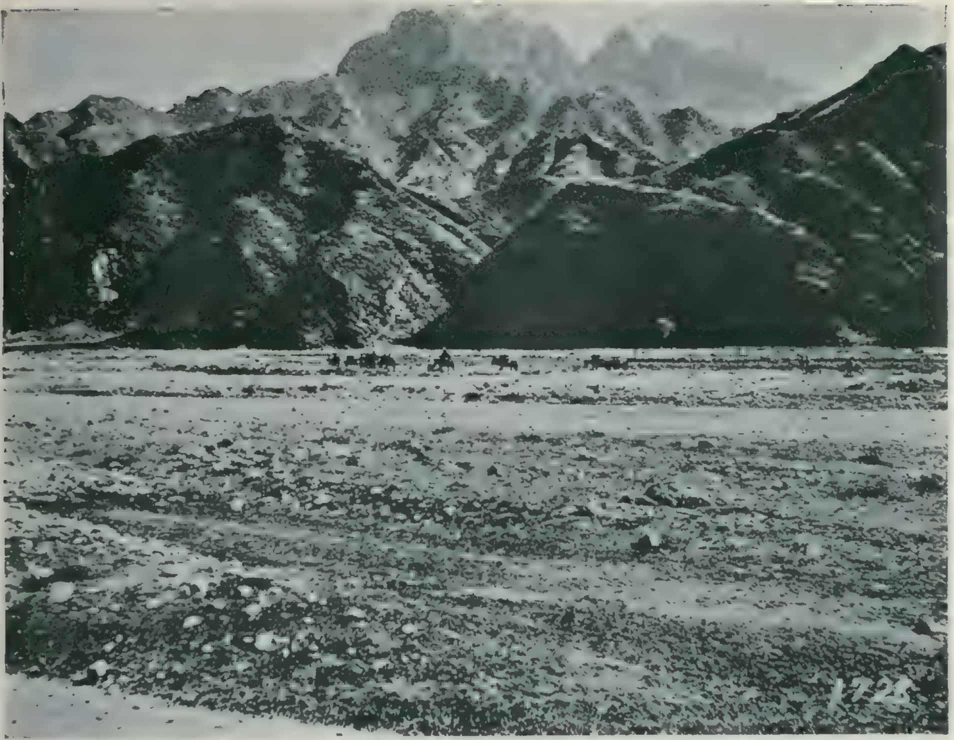
The use of posts and beams for the better houses and temples is general throughout China, and second-hand beams are commonly sold. They consist of tree trunks stripped of their bark and somewhat smoothed. A post of this kind 30 feet high is of very unusual dimensions and the cost is correspondingly great. In a new temple at one of the great monasteries, to which the Empress Dowager had given largely, the posts averaged 30 odd feet in height and were covered with red lacquer which concealed the undressed surface. There were about twenty of them and their cost had been a very considerable part of that of the entire structure. How such trunks are obtained and transported I do not know, as I did not see any lumbering operations in progress. They must be brought from a long distance by the most primitive methods.

Big Prices For Small Sticks.

In north China, lumber is a very rare commodity. The severity of the climate creates a demand for fuel, which long since exhausted the natural supply and drove the people to ingenious expedients for burning twigs and grass. Sticks of wood an inch in diameter and 8 inches to a foot long are to be had, but their cost is beyond the reach of any but the well-to-do. They are obtained by cutting off branches of quick-growing trees. Huge bundles of brush are brought in by the mountain men, who gather them on the least accessible mountain summits; and charcoal, made in districts of scanty population where willow and other underbrush has a chance to grow, is the common fuel of those who can afford the luxury. But the average farmer of the country burns grass or stubble. The grass is gathered by boys, who are sent out to crop it with sharp, crooked knives with which they scratch it up by the roots from among the rocks of the mountain sides. One will meet groups of the little fellows working like beavers several miles from their villages, up on the heights where there is not sufficient soil to justify the farmers in building terraces on which to plant a crop.

Grass For Fuel.

It seems as though the two great needs, that of food and that of warmth, here come into competition. To supply food every square yard of arable land is tilled, and the soil from slopes which can not well be cultivated is gathered on terraces and there made to yield a crop. By building walls and scratching the surface a system of terraces is carried high up on the mountains, and there seems to be scarcely any place where grass or shrubbery can grow for fuel. But there are some hardy grasses and some shrubs which the most persistent rooting will not destroy, and among these the people gather their crop of fuel. The fields yield stubble and not a scrap of it is lost. When the harvest has been gathered and the fields look bare, at least to a foreigner's eye, the Chinese goes over them with an automatic rake, which not only rakes



The price that China pays for ruined forests: mountain sides dumping their rocky debris on the once fertile Plains. Over thousands of square miles deforestation has evicted the population.

but gathers into itself every blade of dry grass or bit of corn stalk. He walks along with the handle hanging over his shoulder, and leaves a perfectly bare track about 30 inches wide, the width of the rake, behind him.

A Good Land For Trees.

In the rich province of Shan-tung, one of the eastern provinces of the Empire, which has been occupied by the Chinese for more than four thousand years, this process of soil gathering and of destruction of all vegetation except that which is grown as a crop, has progressed almost to its ultimate limit. Yet it is evident, from the old and vigorous trees which are found in the villages and in the temple grounds, that the climate is a favorable one for willows, cottonwoods, and elms, or trees which resemble them in generic character.

A still more striking instance of deforestation is found in the mountains of northwestern Chi-li, where the altitude of the valleys is 4,000 feet and the broad flat summits rise to 10,000 feet. These mountains have been occupied by wandering peoples and traversed by caravans for several thousand years. They harbor many monasteries of Buddhist priests, established since the introduction of Buddhism in China in the year 68 A.D., but a good growth of coniferous forests, of which a few remains are still to be found in remote gulches, is said to have covered the mountains up to the time of the Emperor Kang-hi, the first of the present Manchu dynasty 1665 to 1723, Kang-hi made several pilgrimages to the central shrine of Buddhism in these mountains, Wu-t'ai-shan, and conceived the idea that it would be well to populate the district with immigrants. He allowed the people whom he induced to settle there to cut the timber, and they probably found in it a good source of revenue for the time being. They did their work thoroughly—so thoroughly that at present one looks out over the mountain summits absolutely bare of vegetation, and one travels through valleys choked with the debris of torrents. In something less than two hundred years the aspect of the region has been utterly changed from one which old Chinese writers described as abounding in forests, with many springs and running brooks, to one in which there is scarcely a stick to be had. Living streams are found only in the larger valleys, and all the mountain slopes are scored with deep and ragged gullies. The condition has passed the help of man or nature, and it is rather a question of decades than of many centuries, before the soil will have disappeared and the mountains will stand out in utter nakedness.

In southern China, where the needs of man are few and where the luxuriant bamboo supplies most of them, trees continue to grow. In northern China, where the demand for wood is great and the climate is adverse, there is no longer any forest. Individual need has been indulged at the expense of public weal, and in the absence of any public opinion or reasonable foresight, the natural supplies have been exhausted and the forest laid waste.

The land of famine! North-western China, a country of bitterly cold winters, has so completely destroyed its sources of wood fuel that children are commonly found laboring in the fields after the scanty harvest grubbing up grass roots to help keep the tiny stoves alight. Only the very rich ever see a supply of real wood or charcoal.

Terracing the Hillsides.

There is but one saving clause in the situation, which though it does not affect the forest, does modify the results of the forest's destruction. *As they laid bare the mountain slopes, the Chinese realized, probably at a very early date, that the fields they cultivated where the trees had grown were being swept away.* They learned the art of building soil reservoirs —that is of terracing, and have become experts in that method to which the inhabitants of old Italy and Germany have also been driven; but in China the methods have been carried further than anywhere else, and one finds that there is but one limit to its development. As we would consider it useless to build a reservoir for water in a waterless country, so the Chinese find it of no avail to build walls to catch soil at a place where no soil can be obtained; but, provided it is possible to gather soil by scratching the surface and allowing it to wash into a reservoir behind a wall, or provided soil can be gathered in baskets and carried to a place where it can be held, they will build the wall and accumulate the soil. One thus finds, high up toward the mountain summits, terraces adjusted to the contour of the surface, sometimes not more than fifty feet long and not wider than will accommodate two rows of corn. Thus the Chinese have saved their land from utter destruction, but the north Chinese live in a country where a tree is scarcely known outside the village compound or temple yard, and where the chief use for lumber is for heavy coffin boards.

Chinese refugees fleeing southward to escape the terrors of the famine.

Premier Drury on Ontario's Policy

(From an address to the Barrie Community Club)

MR. Drury proceeded to take up his subject—Conservation — dealing first with it as applied to our forest resources, which he divided into three heads, viz., the farm woodlot, municipal forests and provincial forests. In Simcoe county there are great possibilities for municipal forests, it being estimated that there are 120 square miles of land unfit for other purposes. Were this completely reforested, in 60 years it would provide marketable timber that could be cut at the rate of two square miles per year, which would keep busy a dozen sawmills, afford a big fuel supply, and yield a revenue that would pay a large part of the taxes. To leave these waste places as they are is a sin against posterity. The administration of the provincial forest wealth is a large and difficult problem. This wealth has been largely dissipated and we are coming to a period when, unless wise methods are used, we will be in sight of the end of it. In the north country large areas have been left littered with logs that are not first class and with accumulation of waste from lumbering operaions fire gets in and not only are the seeds in the ground destroyed but the soil itself, so that it will be hundreds of years before the area thus burned can reforest itself. The forest wealth has been seriously impaired. What is left must be wisely administered and protected from fire. This will cost money but it must be faced. Future concessions will provide for cleaning up the area from which the timber is taken so that the forest may have a chance to renew itself, which can be accomplished in 45 years. Forest reserves should be harvested when ready and the new timber given a chance.

At Rockland, Ontario, Senator Edwards, of Ottawa, planted 20,000 white pines and 15,000 red pines in 1914 as an experiment in reforestation. The red pines did exceedingly well. The average height of 200 trees is now 9 feet, and of the 25 tallest trees 11 feet.

What Trees are Worth Repairing

By J. Franklin Collins

Most trees with only a few dead limbs are unquestionably worth attention. Others that have many dead limbs or decayed areas may not be worth the expense of repairing them, particularly if they are rapid-growing short-lived trees. This point should be considered very carefully before any repair work is undertaken. In any event a diseased or insect-infested tree should not be allowed to remain as a menace to near-by trees which are in a more healthy condition or entirely healthy. It should have all diseased or insect-infested bark, wood, or leaves removed and all freshly cut surfaces properly treated, or the entire tree should be removed. The diseased portions should be burned immediately. No one can decide better than the owner whether a tree is worth the expense of trying to save it, because the actual commercial value of an ornamental or shade tree usually has nothing to do with the decision. It is generally a question of esthetic value, or historic associations, or rarity of species. A man who has had experience in repairing mutilated or diseased trees may be able to say definitely whether it is possible to save the tree, but the owner, who has to pay the bill, is the one who will have to decide whether the tree is worth the cost of repairing it. Often the owner will be better satisfied in the end to have a badly diseased or mutilated tree replaced by a healthy perfect one. In expert hands the moving of large trees is no longer a hazardous undertaking.

The "Schoolmaster" on the Dining Car

An Editorial From the Noted Weekly "Printers Ink" of New York.

Members of the class have been repeatedly told by the Schoolmaster of the ravages of forest fires on the source of paper pulp, and the problem has interested all who believe that advertising is one of the cures.

During a recent visit to Canada, the Schoolmaster was handed a menu card in the dining-car.

His eye immediately caught a little green slip, neatly printed and illustrated, and attached to the card.

It was printed in dark blue ink, on the tinted stock, and the picture was of a hunter pulling his canoe up on the shore of a lake in the Canadian wildwood.

The hunter had a pipe in his mouth.

A camp fire had been started back from the water a short distance.

The text read:

"—A Little Talk on Forest Fires.

"Eighty per cent. of the habitable area of Canada is adapted for no other crop than Timber. That vast estate constitutes not a 'wilderness' but an incalculably rich storehouse of raw material for our 5,000 wood-using industries. Timber nowadays is precious stuff.

"The world has less of it and wants immensely more of it. For Canada to own great forests automatically clears the path for new factories, new towns, new population, new sources of public taxes—but—

"We Canadians have ruined the timber riches on 1,000,000 square miles in the past seventy-five years. We did it with fire. We did it with our own hands. Little things—like matches, lighted cigarette, camp fires, land clearing. These things did it.

"A forest tree usually takes 150 years to produce a sawlog—to grow twelve inches thick. Of every four dollars obtained for lumber of one log, three dollars go for Wages and Supplies and one dollar to public taxes and interest on investment. To burn a forest is to burn a payroll. This is a good thing to call to mind the next time you are in the woods: Live forests mean live jobs, live sport, live times. There's nothing in a dead forest for anybody."

This advertising message, distributed in such a unique way, is issued by the Canadian Forestry Association. But why in dining-cars on menus? Because the American who is bound Canadaward on a hunting expedition is a man who dines well—who never misses a meal when travelling. The Canadian ors to the Dominion are cautioned without being lectured. It is done indirectly.

The Land We Live In

By Robson Black, Secretary, The Canadian Forestry Association

A review of the Dominion's timber wealth, and the progress towards forestry methods.

THE forest represents Canada's most widely disributed crop. Excluding the great tundras of the far north, equal to one-third of the naion's area, from 60 to 80 per cent. of the remaining lands are of non-agricultural character. Their economic value consists mainly in their stands of timber or timber-growing potentialities.

The marked enhancement of the value of accessible forest areas all over North America during recent years, since more accurate inventories have shown an impending scarcity of logs, has developed a keen public appreciation of the national value of the forest resources, and the productive possibilities of what was once termed "wilderness." For example, the manufacture of newsprint paper from spruce and balsam woods accounted thirty years ago for an item of $120 in the export business of Canada; to-day the sales of pulpwood, pulp and paper, mostly to the United States, exceed $120,000,000 a year. The Canadian paper factory provides for one-third of the newspaper requirements of the neighbouring Republic, which ordinarily are equivalent to 40,000,000 newspaper copies daily. Indeed, the exported products of spruce and balsam alone surpass those of any other department of Canadian industry. The Canadian lumber industry likewise has impressed a great object lesson in the economic advantages accruing from the possession of abundant forests. Canadian lumber production now amounts to 3,250,000,000 board feet annually, about five-sixths of which, valued at $93,000,000, goes into export channels.

Wood and More Wood.

Trade tendencies appear to be all in the direction of greater annual "cuts" for lumber and paper purposes. It is a fact of world-wide application that the advent of wood substitutes has been accompanied by an unparalleled employment of wood products. The present annual *per capita* consumption of wood in America is 500 board feet. Timber scarcity and mounting prices may gradually force down this *per capita* rate, already ten times that of some parts of Europe. The market quotations on substitutes, however, are gauged by the primary wood product, and the range of iron, cement and brick materials essential to any construction are subject to the same cost-raising factors as lumber. The future market for the Canadian log and its manufactured derivatives does not seem to be under other than the most favorable auspices.

One may consider, as well, the increasing relative importance of Canada's forests on the North American continent. As a consequence of heavier domestic demand and greater accessibility of many timber tracts, the Eastern United States forests to-day are in a condition dangerously near the line of depletion. The President of the Southern Pine Manufacturers' Association said recently that the exhaustion of standing timber in the Southern States, where the lumber industry of the east is now centred, would force 3,000 mills out of business within eight years. The President of the International Paper Company, which dominates the newsprint industry of the United States, asserted last year that there do not remain two stands of spruce in the Eastern States that would justify the erection of two additional fifty-ton pulpmills. To these may be added the testimony of the Chief Forester of the United States that the country annually cuts three times as much timber as is now provided by annual growth under the present wasteful methods generally in effect. The States of Maine, New Hampshire, Vermont, Massachusetts, for example, have but a tithe of their coniferous timber supply of fifty years ago when the population was very much smaller. The American States bordering the Great Lakes, as Michigan and Wisconsin, are in a general commercial sense "cut out" with little probability of timberland regeneration till long past the span of this generation.

Canada a Great Exporter.

Inasmuch as five-sixths of Canada's lumber production is taken up by foreign markets, the United States' situation as regards the raw materials of the forest, has vital bearings, for Canada more and more will be called upon to meet deficiencies in the republic's supplies. While such a prospect may at first sight appear wholly advantageous, one must also consider that the total timber contents of the Dominion would be incapable of meeting United States' demands for even twelve years.

Two pictures that refuse to agree; a busy lumber mill town and a stripped forest.

Dead forests kill off population. Canada's strongest bid for new industries, new population, new towns, lies in the protection of her forest areas which cover 80 per cent. of our national area.

The axe may destroy a tree, but it also creates a job. The fire fiend is at once a tree destroyer and a job killer.

The Stimulus to Forestry.

The new international status of the Canadian pulp and paper trade, achieved in a decade, and the recognition of severe limitations in the forest possessions of North America, have necessarily given significance to forest maintenance and development within the Dominion. Land classification, with a view to extracting from every square mile the utmost of its natural potentialities, is now favoured by all Dominion administrations, and has been undertaken actively in several of the Provinces. This has brought to public attention the fact that not 10 per cent. of the whole area of British Columbia is useful for farming. About 30 per cent. of Alberta, Saskatchewan and Manitoba may be of agricultural value. From 60 to 80 per cent. of New Brunswick and Nova Scotia are best adapted to other than field crops, while in the Province of Quebec, the first portion of Canada to be settled by farmers, not ten million acres are under the plough to-day out of 250,000,000 acres included in the old boundaries of the province. A very high percentage of the lands now under wooded cover—fully 90 per cent.—will never be converted to agricultural purposes. It is possible that there are more square miles of the Dominion's surface that must be put back under forest crops, than there are square miles that intelligently may be taken from their wooded state and used for farming.

Our Canadian Trees.

The limits of botanical distribution of the commercial timber species of Canada are quite fully and finally marked, chiefly by the Geological Survey. Hardwoods, although representing an enormous volume of timber and comprising two-thirds of the forest cover in the region of highest industrial development in Central Quebec, may be left out of consideration, owing to their relative inconsequence under present commercial standards. Poplar, for example, represents half the forest tree volume of the three prairie provinces (totalling 24 billion feet of saw timber, but is not at present commercially convertible except to a slight degree. Poplar, however, is bound to assume great future importance. The coniferous, or so-called softwood species, which supply about 95 per cent. of Canadian mill requirements, are for Eastern Canada: white and red and jack pines, hemlock, spruce and balsam fir, in the West of Alberta and in British Columbia, Douglas fir, hemlock, yellow pine, various spruces and firs, cedar and larch.

Summarizing the extent of Canada's potential timber land, containing the afore-mentioned species, Dr. B. E. Fernow, Dean Emeritus of Toronto University College of Forestry, asserts that there are 150,000 square miles in British Columbia (modified to 135,000 square miles by the later survey of the Commission of Conservation), and another 150,000 square miles in the Eastern Provinces. "But this is not actual, only potential timber land, as far as not cut, occurs in both territories only in more or less scattered, larger or smaller, patches.: This mixture of non--productive and productive areas makes the attempt at estimating contents hazardous. But if we reduce the Eastern area involved by limiting it to the height of land, to 100,000 square miles,

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HOW THE PROVINCES COMPARE IN TIMBER

Estimated stands of merchantable coniferous timber by provinces, including pulpwood:—

British Columbia	358	billion feet, board measure.
Alberta	21	,, ,,
Saskatchewan	14	,, ,,
Manitoba	7	,, ,,
Ontario	154	,, ,,
Quebec	212	,, ,,
New Brunswick	20	,, ,,
Nova Scotia	10	,, ,,

and accept as an experience figure over such a large area, an average of 2,000,000 feet, board measure, of saw timber per square mile, and hence concede 200 billion feet to the eastern forests, we shall probably have overstated the case. In the western mountain forest, the unproductive area is much greater, but the stands contain larger quantities. Applying an average of 3,000,000 feet to the productive area in the Rock Mountains of 25,000 square miles and of 10,000,000 feet on the productive 25,000 square miles of coast timber, we have altogether 325 billion feet. (The latter figure was increased to 349 billion feet by the recent survey of the Commission of Conservation.) "This," concludes Dr. Fernow, "would bring the total stand of commercial timber for Canada, leaving out pulpwood supplies, to between 500 and 600 billion feet. In addition, a very large amount of pulpwood that cannot as yet be estimated is in existence."

With Dr. Fernow's estimates, other expert opinion is in substantial agreement. Mr. R. H. Campbell, Director of Forestry for the Dominion, observes that the present stand of commercial saw timber is between 500 and 800 billion feet, board measure, covering an area of approximately 250,000,000 acres. This estimate of quantity and area refers only to timber of commercial value as saw timber. The quantity of pulpwood is estimated at from 80,000,000 to 1,000,000.000 cords. Firewood or tie and pole material of any description are not included in any of the figures given.

Wood Demand Increases.

As to the Dominion's' ability to maintain her present array of nearly 5,000 wood-using industries, with annually increasing consumption, some interesting, although far from conclusive, estimates have been made. Assuming that the country's supply of saw timber amounts to 600 billion feet, board measure, and that the annual cut is 3¼ billion feet, then with no change in existing conditions, the saw timber supply will be exhausted in 184 years. However, in five years of normal national growth prior to 1912, our lumber cut increased on an average by 200,000,000 feet per annum. Should such an increase become necessary in the future, as would seem very probable in the event of improved labor conditions, the national timber supply would by no means outlive another century.

Into any such calculation there enters the factor of annual growth, or increment, but upon that point so little data exists as to make general statements at present valueless. This is one of the research projects upon which the Dominion Commission of Conservation is actively engaged. Entomologists who have made extensive studies in many parts of Canada regard insect and fungous diseases as causing an annual loss equivalent to $75,000,000. Damage by windfall is another source of serious depreciation in timber stands. Forest fires, although now modified in their violence by Government and private protective agencies, yet manage to strip the country each season of several million dollars worth of merchantable wood, and in many instances do irreparable harm to the regenerative capacity of the forest lands. Taking together these destructive elements—fire, windfall, disease, both insect and fungous—it is open to question whether over a long period of years a net increment through timber growth can be claimed in the unregulated forest.

The forest resources of each of the Provinces of Canada are briefly sketched as follows:—

British Columbia.

Of the total land area of British Columbia, 355.855 square miles, approximately 200,000 square miles is incapable of producing forests of commercial value. About 145,000 square miles lies above the merchantable timber line, and on 55,000 square miles of the area below the timber line, the forest-growing conditions are unfavorable, or fires have destroyed the hope of any re-establishment for centuries to come. Of what remains, only about 28,000 square miles carries stands of from 5,000 to 8,000 feet, board measure, per acre, and another 23,800 square miles in the interior of the province carries stands reaching between 1,000 and 5,000 board feet per acre. The Commission of Conservation states that through fire losses British Columbia has sacrificed approximately 665 billion feet, board measure, about equal to the total remaining stand of timber in the whole Dominion. The total of saw timber available in British Columbia is 349 billion feet, board measure. In the annual cut of the province, Douglas fir accounts for two-thirds. Fourteen species of wood are reported in the annual returns. The lands of the province are under the administration of the Provincial Government, with the exception of the Railway Belt, consisting of a strip twenty miles wide on either side of the main line of the Canadian Pacific Railway across the province which is administered by the Dominion Government. The latter authority also controls the Peace River Block in the north-east corner.

Alberta.

The Province of Alberta, the forest resources of which are held by the Dominion Government, has a total land area of 161,872,000 acres, of which about 5,416,000 acres are regarded as containing more or less saw timber estimated to be about 21 billion board feet. Four timber reserves have been set apart, and contain 12,500,000 acres. Spruce, jack pine and poplar preponderate in the annual cut. With the exception of birch and poplar, Alberta's forests are wholly coniferous.

As concerns the North-West Territories and the Yukon as a source of timber, the ravages of fire have already been enormous and large sized trees in heavy stands are not commonly met with. The greater part of the northern area is composed of treeless tundra and population is sparse. Beyond meeting local demands for rough construction, fencing, mining, etc., the timber supply of this portion of the Dominion is not important.

Saskatchewan.

Saskatchewan has a total land area of 155,764,000 acres, and although more than two-thirds of this is probably unfitted for uses other than timber production, the area actually timbered with merchantable trees is only about 750,000 acres. The Province cut in 1915 62,864,000 feet of lumber, over three times as much as Alberta, but has not operated on as large a scale since. Spruce is practically the only wood taken out. The forest reserves of Saskatchewan cover 6,197,707 acres.

Manitoba.

Manitoba, with a land area of 148,432,640 acres, is to-day about 70 per cent. wooded. Only 1,920,000 acres, however, contain saw timber of commercial dimensions, and the total stand of the latter is given by the Dominion of Forestry Branch as 6,850,000,000 feet. Manitoba's forest types not only cover the coniferous trees associated with the northern forest type of Saskatchewan and Eastern Alberta, but include as well an amount of red and white pine, cedar, black ash, white elm and basswood, which are associated with what is called the Southern Laurentian type of Ontario and the other eastern Provinces. Manitoba's cut averages about 90 per cent. spruce. Small quantities of poplar, tamarack, jack pine, birch, oak and elm are also produced. Manitoba has five forest reserves, maintained by the Dominion Government, containing 2,606.400 acres.

Ontario.

Ontario won its great reputation in the lumber trade by exports of white pine. This splendid wood remains the dominant species in annual production, but, as regards the Crown Land areas, is rapidly being displaced by other woods, as a consequence of the limitation of supply. Taking the Dominion as a whole, spruce now has a heavy lead in the amount cut each year, with Douglas fir second and white pine third. Ontario's white pine stands are estimated at 40 billion feet.

Of Ontario's total area of 234.163.200 acres, the greater part of the northern lands is wooded; mostly with spruce, jack pine, poplar, balsam fir and tamarack. South of this comes the Southern Laurentian type covering 100,-

000,000 acres in Ontario and Quebec, supposed to contain about 200 billion feet of saw timber in both Provinces. From 70 to 90 million acres is regarded as the productive forest area of Ontario, including forest reserves of 11,539,200 acres.

Quebec.

Of the 442,153,000 acre of Quebec, since the extension of its boundaries, 367,000,000 acres belongs to the northern forest type of pure conifers, 50,000,000 acres to the Southern Laurentian type of mixed conifers and hardwoods, and 5,000,000 acres to the hardwoods. South of the St. Lawrence in Quebec, the type resembles closely that of the Maritime Provinces and covers about 20,000,000 acres. Spruce has top place in the annual cut, accounting for more than half, balsam fir is second and white pine third. Birch forms an important hardwood, making up about 4 per cent. of the total cut. The conifers in 1915 formed 93 per cent. and the hardwoods 7 per cent. of all the wood taken out.

New Brunswick.

New Brunswick has a land area of 17,863,000 acres, and two-thirds at least may be regarded as productive or potential forest land. The standing timber is estimated at 22 billion feet, red spruce and balsam accounting for about 60 per cent., pine, hemlock, cedar and hardwoods for the remainder. The conifers make up 98 per cent. of the annual cut. In 1919, the Province's lumber production amounted to 220,000,000 feet.

Nova Scotia.

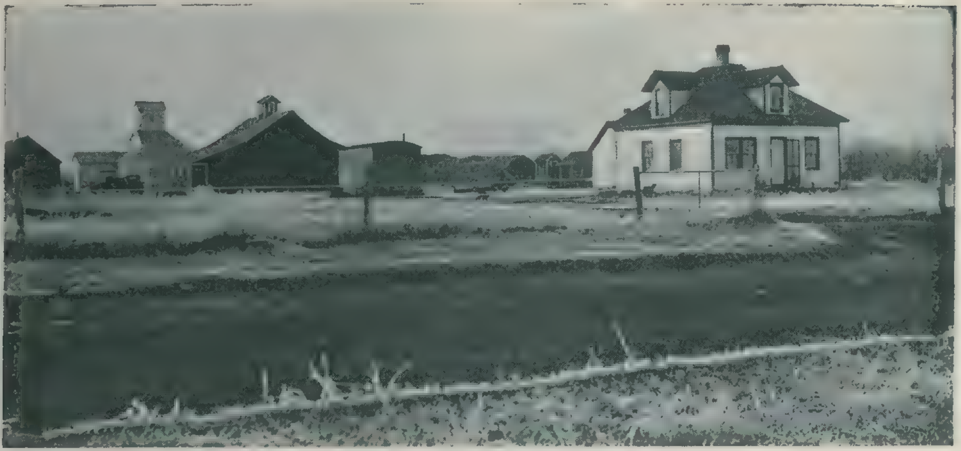
Nova Scotia has a forest area estimated as 5,744,000 acres out of a total land area of 13,483,000 acres. An estimate of 10 billion feet has been given for the coniferous saw timber, with about 5 billion feet of hardwoods. Red spruce and hemlock account for about 8 billion feet of the total.

The Province of Prince Edward Island has such a small forest area as not to affect the total calculations for Canada.

A fact of important bearing upon the forestry problem in the Dominion is that the title to approximately 90 per cent. of the forest lands is vested in the Crown. Cutting rights are leased, nominally for one year in most parts of country, but renewable upon fulfilment of the conditions. The seigniories of Quebec, some large railway land grants, and instances of outright alienation of ground title and standing timber in British Columbia, Quebec, New Brunswick and Nova Scotia, account for most of the forest areas placed beyond the regulative jurisdiction of the Crown. The bulk of the annual cut of saw timber and pulpwood, however, comes from public-owned lands. It is true that the licenses have, in many cases, been transferred again and again for large considerations. This limits the degree of State interference with the present license holders, as radical restrictions on timber cutting might fall upon innocent investors.

Forestry Experiments.

The present stage of silvicultural practice in the Dominion, except for the Dominion Government forest reserves in the prairie provinces and the British Columbia "Railway Belt," 'may be said to be entirely experimental. Continuous timber production is everywhere recognised as essential to commercial safety. Until very recent days it was regarded as an assured fact. Forest surveys and investigations, however, have exposed the fallacies of the old time theory that "a new cut every thirty years" could be expected. The plain fact is that, except in British Columbia. the forces of destruction, by accident and exploitation, are accounting for three or four times the wood volume that the most



No. 1.—General view of the farmstead of D. H. Pruden, M.L.A., near Botha, Alta. The building to the extreme left is an old barn; then comes the blacksmith shop adjoining the elevator. The latter faces a road or driveway, and has 16,000 bushels capacity. Next is the barn proper, and then a small granary, of which Mr. Pruden has a number distributed at different points over his 1,280 acre farm, 800 acres of which are under plow. These granaries are on wheels, and can be moved here and there. Following the granary can be seen grain stacks, outhouse buildings, and then the home of the farmer. When Mr. Pruden located here in 1902 it was a barren spot as far as trees were concerned. There was not a house within 35 miles. He saw that trees could be grown in the section, and after being without them for a good number of years set to work to secure them.. The result of his efforts are told by the other pictures. To the right of his home the six year growth of trees (Russian poplar) can be noticed. From the trees eastward, through the planting of the trees, soil drifting in the yard has been overcome. For three years there has been no drifting in the place, although prior to that there had been drifts at times 10 feet high. Last winter there was no drifting, although outside the yard the snow was piled to a great height.

No. 2 is looking down the rows on the west side, through the windbreak on the west. The rows are nine feet apart and the trees four feet apart in the rows. The growth that has been made in the six years can be guaged by the figure of Mr. Pruden standing in the row, he being six feet tall.

optimistic guess credits to "annual growth" on the lands cut over. The displacement of rule-of-thumb methods by scientifically established facts is now proceeding through Dominion and Provincial Government agencies and by private corporation effort. Forest surveys have been completed in British Columbia, Saskatchewan and Nova Scotia, and are in progress in Ontario and New Brunswick. Studies of forest tree reproduction by the Commission of Conservation, the Dominion Forestry Branch and the New Brunswick Forest Service, and the establishment of experimental plots upon which various methods of silvicultural management may be tried out, are now in progress and have the thorough support and co-operation of the wood-using industries of Canada.

Tree Planting.

The planting of trees upon cut-over or barren lands is a project of lively popular interest, inasmuch as the layman commonly thinks of forest regeneration only in terms of new plantations. Such paper manufacturing companies as the Laurentide and Riordon of Quebec, have set out some millions of spruce seedlings from their own nurseries, and regard the procedure as sound commercial investment. Other pulp and paper companies are preparing their nurseries and will adopt a planting programme to supplement their wood supply. Obviously, the pulp and paper companies, having huge investments in million-dollar mills over a waterfall, have been the first to experiment with forest tree planting as a means of stabilising their wood supply. Some factors have militated against more general planting, as for example, the impossibility of establishing plantations on Crown Lands until the rights of planter and public in the ultimate crop have been made clear; the lack of experience in nursery and plantation enterprises under American conditions; the insecurity of most forest areas against fire and high labour costs. With the exception of the latter, these difficulties, particularly in Quebec, are fast being cleared away.—Reprinted by permission of the London Times.

How Tree Seed is Gathered

By Arthur Herbert Richardson, M.A., M.F.

Ontario Forestry Branch

FUNDAMENTAL to all reforestation problems is the growing of adaptable nursery stock, and prior to nursery stock is the securing of suitable seed. It is generally recognized by botanists as well as foresters, that seed collected from plants in one locality is best for sowing in that same locality. Consequently it has been the policy of this Department, in so far as possible, to collect seed from our native trees for planting in connection with its reforestation work.

Seed Years.

Most species of trees have seed each year, some bear an abundance, others a small quantity. Still others, chiefly conifers, have an abundance of seed every second, third or more years. When such an abundance of seed occurs in this way, it is said to be a seed year for that species. The season of 1920 was a good seed year throughout Ontario for the following coniferous species which are needed for the work of this Department, white spruce (picea canadensis), balsam (Abies balsamea), white pine (Pinus strobus) and white cedar (Thuya occidentalis). Accordingly then, collecting areas were established and large quantities of cones were gathered. The work carried on by the writer and on which the material for this article is based, was done in Simcoe County on property owned by the Federal Government and known as Camp Borden district. The species sought particularly were, white spruce and white cedar, and of these 275 bushels were gathered besides smaller quantities of balsam, white

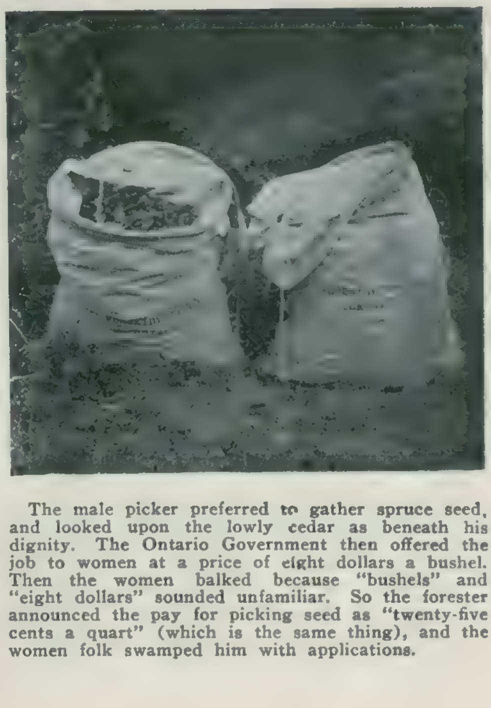
Collecting seed for tree planting to help carry out Ontario's new reforestation programme. Some of this seed-collecting work is paid for at the rate of $8 a bushel.

pine, tamarac (Larix americana), red pine (Pinus resinosa) and hemlock (Tsuga canadensis).

Seasons for Ripening.

Gathering cones of these species might have been commenced during the last two weeks of August. Collecting did not begin however, until the second day of September. The first frosts here came on the nights of the second and third, followed by bright warm days which created ideal conditions for seed ripening and compelled prompt action if the seed was to be had still in the cones. But owing to what seems to be a generic difference in trees of some species, and in this particular case, white spruce, there was considerable variation in the time of ripening of different trees some being as late as the twentieth of the month. Any cones that were gathered after this date wer either partially opned and classed as seconds, or had been cut down by squarrels and taken from their hordes. Balsam exhibited more uniformity in ripening and after the fifth of September, it was practically impossible to secure any seed, as the cones fell to pieces as soon as one attempted to climb the trees. Tamarac, white pine and red pine were like spruce, although red pine cones were so scarce as to hardly warrant mentioning. Cedar and hemlock were much later in coming to maturity, the collecting of the former commencing on the fifteenth of September and lasting for a month.

The picking was done for the most part by local help, but in a farming community, such as this is, there were many demands for workers to assist in bringing in the fall grain. Few were left then, to help the tree farmer in gathering his seed. As a result of this, local help



The male picker preferred to gather spruce seed, and looked upon the lowly cedar as beneath his dignity. The Ontario Government then offered the job to women at a price of eight dollars a bushel. Then the women balked because "bushels" and "eight dollars" sounded unfamiliar. So the forester announced the pay for picking seed as "twenty-five cents a quart" (which is the same thing), and the women folk swamped him with applications.

was supplemented with men from the city. A camp was established, in which the equipment was supplied by the Department, and under its supervision; the board being left entirely with the men employed. In this way, four city men found it worth while to spend a vacation, varying from one to three weeks camping in the open and at the same time combining pleasure with profit.

In the case of cedar it was difficult at first to interest men in picking such small cones. Those who had worked at spruce did not wish to exchange the breezy height of that species for standing on the ground picking cedar, even though the offer was tempting as eight dollars a bushel. Accordingly then, the interest of the women was enlisted and to make the offer more appealing, the same price was put in a different way, namely—twenty-five cents a quart. This was something they could do. It was like picking berries. The women commenced gathering cedar, and bless me, we could hardly stop 'em.

Equipment for Picking.

Each man who gave all his time to the work was supplied with a picking bag which was big enough to hold all the spruce cones he wanted to pick from a tree at one time. It had a wide open mouth to facilitate filling and allowing two hand picking, and an adjustable top. When a workman had finished picking high up on a swaying spruce, it was found difficult to descend in such a way as not to upset the bag—not to mention himself. To remedy this, a special top with a draw string was inserted. This hung inside the bag out of the way during the time of picking, but if the workman wished to move about in the tree, he lifted the top and pulled the string. Or if he wished to descend, he did likewise and dropped the bag to the ground and came down unencumbered. Each man was also supplied with a tree rope, an arrangement similar to that used by telephone linemen. With this equipment, all the spruce, balsam and tamarac cones were collected as well as some of the cedar.

Prices Paid For Seed.

When cones were picked from healthy, open grown spruce trees, a man could average three bushels per ten hour day. This was the amount on which the price, two dollars and twenty-five cents a bushel was based. For seconds, the price was reduced to two dollars a bushel. For the small quantity of balsam that was gathered, the same price was paid, although this is a trifle high compared with spruce. White pine was one dollar and a quarter, tamarac and hemlock the same as cedar, that is, eight dollars per bushel. In each case, and particularly the cedar, the cones had to be practically free from browse and if this were not so, the estimated amount of foreign matter was deducted from the measurement.

Drying and Extracting.

One of the difficulties of handling large quantities of cones that are at all green, is to keep them from heating. In order to insure against this, the cones were spread on canvas in the sun, or on racks in the seed house, and turned once or twice a day. This preliminary drying caused them to open a little and to shed some of their seed. After this they were taken to the extracting room. Here they were placed in a drum thirty inches square and six feet long, covered with screening coarse enough to let the seed fall through, and fine enough to let the cones remain. The drum was then revolved by means of a windless on the floor below, and the seed dropped down through a hopper into a bag. After all cones had been treated once in this way, they were again spread on the drying racks and heated gradually from racks to drum from 60 degrees to 125 degrees F. The seed was then cleaned and stored for spring sowing.

In this way the tedious and expensive task of securing tree seed was accomplished, from boughs of redolent trees to the pickers' bag, from bag to drying rack, from rack to extracting drum, from drum to cleaning process, and from this to the nursery beds. Then more trees!

How Safe Is Flying?

by Col. Robert Leckie, D.S.O., of the Air Board, Ottawa

In 1920, 15,260 passengers were carried in Canada with only five fatalities

VERY considerable prominence has been given during the last few months to aeroplane accidents in Canada and elsewhere to such an extent that the unfortunate impression has been created in the minds of the general public, that flying is a highly hazardous occupation. During the war the casualties in active service and the fatal accidents in training in the R. A. F. were admittedly very high. This was due, however, to the system of intensive training made necessary by the rapid expansion of the R.A.F. to meet the ever increasing demands made upon it. The fall of an aeroplane to earth is always spectacular, and an ever ready press never fails to make the most of the event as a news item. As a matter of fact the ratio of fatalities to the number of hours flown is really very low.

In Canada during the last 11 months 15,260 passengers were carried in aeroplanes for hire. These aeroplanes flew a total of 6,811 hours, covering 429,177 miles. Dur-

The aeroplane camera and its value in surveys. An extraordinarily clear photograph of an English golf links taken by the Aircraft Manufacturing Company.

ing this time only five fatal accidents have been reported. There is no doubt, however, that each accident was heralded by the Press as another horrible fatality, and a prominence given to it entirely out of proportion to its importance. One reads of railway accidents from time to time, but the news item is usually contained in a very small paragraph.

As the present war type machines give place to those designed and built for civil operations, the margin of safety will increase. During the war the brains of the designer were concentrated upon speed and climb. These designers are now paying more attention to the factor of safety, and to the general security of the machines. The ideal commercial machine has not yet been evolved, but it is apparent that the war product is gradually giving place to a more ideal type. When the transition is finally accomplished, it is safe to say that the number of fatal accidents will be still further decreased.

Stunting to Blame.

One of the most fruitful causes of accidents is the irresponsible pilot. During the war aeroplane pilots were taught all kinds and conditions of aerial stunts, aerobatics being part of a pilot's course of instruction. In the minds of some of our very young pilots an aeroplane exists only to be looped, spun and Immelmaned, and the temptation to continue his war training in civil life is irresistible. There is no place in civil life for stunts of this nature, and steps have been taken by the Air Board to curb the unruly spirits, whose antics endanger their own lives and those of their passengers. It is now an offence against the law for a pilot to perform any of the above-mentioned stunts with a passenger aboard, and it is felt by the Air Board that this measure, however irksome it may be to the pilot, will go far to prevent some of the unfortunate accidents which we witnessed during the last year.

That flying can be carried out constantly and under varying conditions is evidenced by the following statistics collected at random from pilots at Air Board Headquarters:

Aeroplane, Seaplane and Flying Boats.

	Slight accidents.	Serious accidents.	Accidents entailing bodily injury.	No. of hours flown.	No. of years flying.
Pilot (a)	1	none	none	750	5
,, (b)	2	none	none	900	5
,, (c)	2	none	none	1,000	4
,, (d)	none	1	none	1,200	2½
Aeroplanes					
Pilot (e)	1	none	none	1,400	5
,, (f)	1	1	none	900	2½

800 Hours Flying—No Accident.

These figures, as I have already stated, collected at random from Air Board Headquarters, do not indicate that flying should be classified as a hazardous occupation. The Operation Branch of the Air Board has carried out operations under widely divergent conditions and although some slight injury has been done to machines, none have been "written off," and no one has been hurt. Still more remarkable probably is the record of the C.A.F. where one would nominally expect serious accidents to take place, where about 800 hours of flying have been carried out in training without injury to officers or men.

The above facts indicate that so long as flying is properly controlled and sane pilots are operating under sane orders, with the ever present desire to stunt curbed, that flying is really no longer a hazardous occupation.

Calgary's Good Word.

The Calgary Board of Trade has officially endorsed the work of the Canadian Forestry Association, and urged upon its entire membership the desirability of joining the Association and assisting its educational campaign.

How Sweden Handles Her Forests

by Helge Graeslund

National control of all timber areas with compulsory reforestation

THERE is one question which I have never failed to ask every one of my Canadian friends:

Has Canada got sufficient resources of forests to supply lumber consuming industries with raw material, without providing for regrowth of her forests?

The invariable answer has been: "No."

If that be true, it is quite evident that only good reforestation methods will enable the further development and maintenance through a considerable time of this splendid industry. Furthermore I have been told that many of your best situated forests may be exhausted in something like 40 years.

Eventually the reforestation problems must be looked upon from the point of view that Canada's forests are one of her richest and finest natural resources, upon which her national wealth is largely dependent, as well as the future of a proud industry in which hundreds of millions of dollars are invested.

Put briefly: reforestation seems to be one of the greatest economic questions at present in Canada, and it is a public affair as well as a private interest of very great importance.

In Sweden we had to face the same situation quite a long time ago. Our lumber industry is older than yours, and as much as 40 or 50 years ago we slowly began to realize what the bitter end would be if we did not tackle the reforestation problem somehow or other. But it is really during the last 25 years that modern methods to an important and remarkable extent have been developed. I would not tell you the truth if I said that everything in Sweden at present is ideal as regards forestry. But simply because we have been experimenting and working for some time our methods may be of some interest and use for you. Of course conditions are very different in the two countries, but the principles, the aim and the main lines are no doubt very much the same.

52 Per Cent. Under Forest.

Of the 41 million hectars (1 hectar equals 2.47 acres) constituting that total area of Sweden, if the innumerable inland waters be neglected, it is estimated that 21.6 or about 52 per cent. is covered by forests. This makes 392 hectars per 100 inhabitants, the average figure for Western Europe being only 37. Of the Swedish forests about 37.5 per cent. belong to the State, 1.9 per cent. to towns and parishes, and 60.6 per cent. to private individuals.

By far the greater part of the forest resources are to be found in the northern half of Sweden, where the climatic and other conditions are very similar to those in Canada. The transport of the logs from the forests to the mills is provided for in an excellent way through innumerable rivers going from west to east. Sweden's prominent position in the world's timber trade to a very large degree depends upon these 19,000 miles of excellent floating ways which at a very low cost carry the timber down to the mills. Most of the mills are concentrated at the mouths of the rivers, on or very close to the coast of the Baltic. These mills get their raw materials direct from the river and ship their products from quays a few yards from their doors.

The rivers are estimated to be able to supply water power amounting to 6½ to 10 million horse power available during six months of the year.

By this brief statistical information you may have got some idea of the general conditions and it may be time to turn to the subject.

Reforestation is a difficult problem. What you do to your forest today won't show its results until 50 or 100 years hence. Reforestation means one generation's work for coming generations. It does not appeal to our business sense at once and it takes quite a long time to realize that it is a first rate investment for the lumbering industry. Therefore it is necessary that the State herself takes the lead, dictates the outlines for the nation's forestry policy. Co-operation between the State and private interests to the benefit of both is the first necessary supposition.

At home the Government has found three ways to do her part of the work: i.e. Legislation, education and the management of her own forests.

LEGISLATION. — The legislation concerning private forests has, in the past, gone through highly remarkable phases of development. From complete freedom about three hundred years ago, they were by degrees made an object of increasingly severe legislation, and finally even lumber felling for household purposes was placed under the control of the State. Then followed a revision which at last once more led to nearly complete freedom. During the last five decades a reaction has set in, imposing several restrictions upon private forest owners with regard to the management of their forests.

Modern legislation has taken into consideration how different conditions exist in different parts of the country and tried to apply laws according to these conditions.

Control of Farm Bush Lots.

In Lappland, the northern districts of Sweden, it was ordained in 1873 that farm owners should not enjoy other rights to the woods on their farms than those of taking without previous official survey such timber as they might require for household needs and for fuel, and of appropriating, subsequent to official surveying and marking for the purpose of selling such timber in addition as can be annually felled without danger to the future preservation of the forests.

In this way the farm forests which form a very considerable section of the forests of the north have been subject to regulations ensuring system to the lumbering there. The immense importance of this will be seen more clearly when it is remembered that these forests are situated in the immediate neighborhood of the Scandinavian Alps which renders their preservation invaluable as protection against over-severity of climate.

It may be pointed out in connection with this that exhaustion seriously affects the soil and the climate in a bad way. I won't go into any particulars whatever as I am sure you know this thing better than I do, but I will take the opportunity of pointing out which tremendous responsibility there is connected with the management of the forest of a nation. Millions of men and women are dying this year in the far East. Why? Because their forefathers did not possess the necessary feeling of citizenship and responsibility for their sons and their country to preserve their forests. And especially nations which have developed agriculture extensively must be careful with their forests as their exhaustion seriously affect the soil and the climate.

A purely dimension law has been enacted for the coast districts of Lappland. This enactment forbids the shipping and the sawing at export saw mills and the employment for the purpose of manufacturing wood-pulp, of pine and spruce timber which at a height of 4.75 meters from the base, does not measure at least 21 cm. in diameter, the bark not included. The penalty for the infringement of this regulation is the confiscation of the timber. Such a law directed as it is against a special form of mismanagement of forests, can easily become a hindrance for the proper care of the timber, which in many places requires the removal of second-rate wood in order that space may be secured for the growth of healthy young trees. The law does not overlook this fact, however, as it instructs the owner of timber in a way that requires the felling of second-rate wood, so as to promote the growth of the healthy timber, if he wishes to ship or saw such second-rate wood, to apply to the proper state-forester, who will then make such a survey of the forest as circumstances may require. This forester selects and stamps the second-rate timber that is allowed to be cut. The State pays the cost for this survey on condition that the owner has arranged the forest in sections for the purpose of being cut in proper rotation and in accordance with a plan approved by the Government Forest Service.

In 1903 a law was passed respecting the so-called "protective forests" the existence of which are a protection against drifting sand, or the lowering of the tree-limit on the high mountains. The law enjoins that timber felling for other than domestic purposes may take place only after a survey and marking of the trees to be cut by the Government Forest Service at the cost of the State.

Compulsory Reforestation.

The other private forests in Sweden are subject to the regulations of the law of 1903, respecting the care of private forests. According to this law, in forests belonging to private persons, lumbering must not be carried on in such a way, nor, subsequent to lumbering operations, may the ground be so treated, as to clearly endanger the regrowth of the timber. If there has been such mismanagement of the forest, the guilty person is obliged to take the steps necessary to secure the regrowth. If the lumbering rights have been made over by the owner of the forest to another person, the owner is responsible for the necessary restorative measures being taken. The burden of seeing that the law in question is properly carried out rests on the Forest Conservation Board, which must exist in every county council district. Besides being entrusted with this task the said Boards have also to promote the proper economy of the private forests by spreading a knowledge of forestry, by making grants in aid of the work of culture, by supplying seeds and plants, etc.

AN ALL-CANADIAN BUSINESS DEAL.

A photograph of the first shipment on a one million dollar order of creosoted railway ties to India—Canadian timber, creosoted in a Canadian plant with Canadian creosote, exported by the H. R. MacMillan Export Co., Ltd., a Canadian firm, insured in Canadian companies, and carried to its destination by the Canadian Merchant Marine.

EDUCATION.—Every part of modern economics requires thorough education. A modern mill requires well trained engineers, modern forestry needs highly educated forestry men. And as regards preservation and regrowth of the forests, the expenses for this purpose are identically the same as the money the mill manager has to pay for repairs and maintenance of machines and mills.

All schools and colleges in Sweden, with very few exceptions, are state institutions. The same with regard to instruction in Forestry. The higher forestry education is provided for at the College of Forestry in Stockholm. The number of students admitted to this college is limited to the probable number of opportunities for their employment so that there is a considerable competition for the opportunity of entering and a high standard of men and work is maintained. There are a higher and a lower course, the first supposed to educate State foresters, the second especially intended for the training of private forest officials. The instruction is both theoretical and practical, including the following subjects: Forest Management, Forest Mathematics, Forest Technology, Forest Botany, Forest Zoology, The Science of Soils, Forest Policy, General Legislation, Book-keeping, Technical Chemistry and Agricultural Economy. The practical work is done during summer time out in forests specially devoted to the purpose in different parts of the country. Journeys are made under the direction of the teachers to study the methods of different companies.

The lower State Schools of Forestry are directed mainly to giving the pupils practical skill in the more important branches of forestry, but also embrace theoretical studies in the fundamental principles of Forest Economy.

As mentioned in the beginning the State owns more than a third of our forests. These state forests are managed by the Government Forest Service and not leased to private companies. The end aimed at by the Government's forest policy is to render the economy of the State Forests as permanent as possible. The two factors, personal, technical knowledge and permanent economy have made the Swedish State forests valuable and well preserved resources. The Forest Service consists of 10 Chief Foresters each one in charge of a "district," 90 foresters managing the same number of "revirs" and 417 rangers who are superintendents of so-called "guarding sections."

As regards forestry of the private companies. The main principle nowadays may be said to be an attempt to arrange the cutting in such a way that in times of good prices in the market the forests are slightly over-cut, in times of low prices the contrary, and the average of timber taken out from the forests corresponding to the regrowth.

Most of the companies have their forests divided into districts managed by graduates from the College of Forestry. These districts are divided into guarding sections supervised by rangers trained in the above mentioned schools. These rangers live on their sections in comfortable houses built by the Company, and constantly surveys his forests. He carries out all orders from his chief forester and has the responsibility for the practical handling of everything respecting his section, marking the trees, organization of the cutting and transport, nurseries, etc.

Trees---and the Future of Our Prairies

by Archibald Mitchell

Western Lecturer of the Canadian Forestry Association

Soil Drifting, the West's Great Menace---How to Offset Wind Damage---a Practical Remedy

THE heavy losses that have been experienced in the last few years from soil drift, have drawn attention as never before to the necessity for systematic tree planting, and it is right our young farmers should know something about Forestry as applied to Prairie conditions, while we still have some soil to protect.

When we talk about planting trees on the Prairie it seems only reasonable to consider for a moment why the Prairie is not already entirely tree covered. For, if trees wont grow there naturally, it does not seem of much use our attempting anything of the kind.

The Trees Are Creeping Back.

It may be easier to do this by looking at what has been taking place the last 20 or 30 years and seeing how far the forest is actually coming back on to the Prairie. There are plenty of men living who remember when there were no trees west of Brandon unless in the river bottoms and the coulees. Now the eastern line of natural bush country reaches to about ten miles from Regina, 200 miles west.

Gainsborough, Oxbow, and Estevan had no trees when first settled.

Now a good deal of that country is quite bluffy.

Down the Goose Lake line of the C.N.R. southwest of Saskatoon, some 12 or 14 years ago there were very few bluffs. Now there are plenty, stretching as far south as Harris. Twenty years ago we used to meet the first bluffs on the old Calgary and Edmonton trail about Didsbury, now they are at Crossfield. Settlers in the Three Hills district now find little bluffs of trees where there was nothing of the kind when they came in there first, and so it goes all the way round. The treeless prairie is really a great big bare arc which is continually getting smaller because it is bounded by an ever encroaching line of trees and which, to all appearance would cover, in time, the whole country if allowed to go on. What has prevented its taking complete possession, has been fire, and what is encouraging it to spread so rapidly since settlement began is the fact that the settlers have kept down the Prairie fires which formerly ran unchecked and de-

This Prairie tree planter, Mr. J. Caldwell, of Virden, Manitoba, has built up a real farm asset. Photograph shows a stand of pure Russian poplar, 28 years old, from cuttings. The stand would be the better for a little thinning out, coupled with under planting with spruce.

stroyed every vestige of forest growth that dares to show itself above the grass.

This forest advance has taken place most rapidly of course where the rainfall has been greatest but even in the very driest parts of the country we find the same thing taking place. One notable instance occurs about 10 or 12 miles west of Macleod on a spot where there is now nearly half an acre of native poplar where, 20 years ago there was nothing of the kind. It is most significant that that bluff has a broad road on one side and a steep cut bank on the other, which form a most efficient fire guard.

So much for nature's success in tree growing on the dry Prairie.

Knowing these things gives us plenty of confidence in our ability to grow all the trees we want if we adopt the right methods. Nature should be able to teach us these methods and so we go to our little native bluffs to find how she manages.

First, though, we have to remember that all growth on the Prairie be it wheat, grass or trees, is a matter of moisture. Given plenty of moisture, we can have plenty of growth. And the interesting thing is we have plenty of rain for our crops most years if we could only use all of it. That is our trouble, the storing of the moisture for the use of the crops. When we talk of storing, naturally we think of losses and how they occur; for if we know where the losses are, we may be able to do something to prevent them.

Where The Rainfall Goes.

There are five ways in which our rainfall is disposed of:

(1) Run off. The running of the rain and melting snow into coulees and being lost that way.

(2) Sinking down into lower reaches of the soil and so feeding springs elsewhere.

(3) Transpiration through the leaves of plants in the function of living.

(4) The sun's heat, and

(5) Drying out by the action of the wind.

Running off we have in plenty on the Prairie as can easily be seen in wet weather or Spring. Floods in our creeks and rivers are the result. We can prevent a great deal of it by plowing deep and leaving the surface of our fields loose so that the rain as it falls may readily enter, to be used later by growing plants.

There is very little, if any, loss on the Prairie from water sinking into the lower soil to appear again as springs. We rarely have rain enough for that.

The only sort of tree planting that creates results as a prairie windbreak is that adopted by such men as Andrew Anderson, of Alsask, Saskatchewan. The plantation is dense and wide.

Then the transpiration of water through the leaves of plants must be carried on or nothing will grow. Indeed, all our efforts are directed towards encouraging the use of water this way. The more water used by the crops as a rule, the better they are.

The foregoing methods of water disposal may be of some benefit, but the last two, the drying out by the sun and the wind are channels of distinct loss and nothing else. On our farms we check this by summerfallowing. Indeed, this is so important that it is the chief business of the farmer on the Prairie, for his crops depend on it and the whole cycle of his farm operations centres round it. Successful cropping depends on conserved moisture, and it is the same with tree growing.

Learning From the Bluffs.

But it is obvious we cannot go on systematically summerfallowing our plantations as we do our wheat fields. That would constitute a steady drain on our resources, a constant expense that would in time become intolerable, and as tree growing has to be done as cheaply as possible, some other method must be found. And the best place to find it is to go back to the little bluffs that are so steadily taking possession of the Prairie and see how they manage, for, after all Nature is the great teacher.

There, we find the young trees growing so close together that the leaves and branches afford such a screen the sun's rays cannot find their way down to the soil to dry it out. In the same way the trees are so close together, and present such a dense solid mass to the passing winds, no matter how high they may be, that they are thrown right over and never get inside to dry out the moisture.

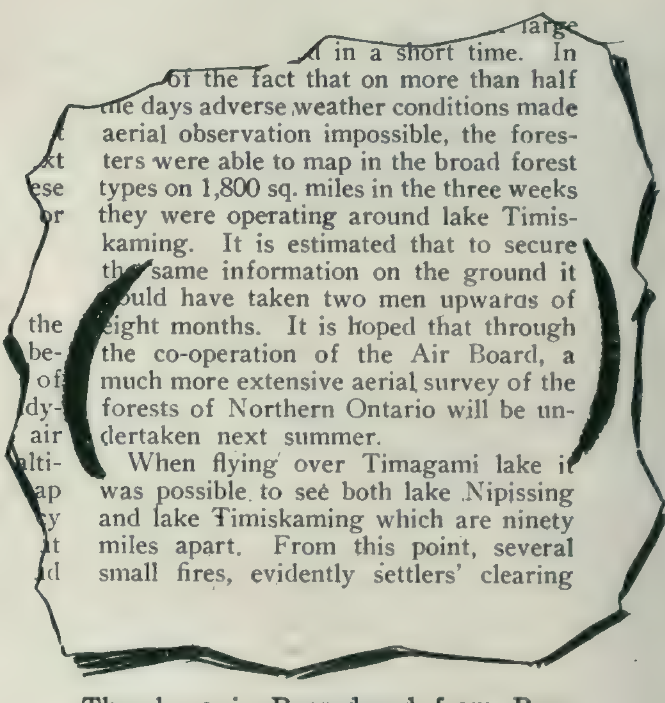
That is the whole secret of nature's success in tree growing.

The great controllable channels of moisture losses are the action of the sun and the wind; the sun shining down and the wind passing through. Nature has her own way of combatting these and in our farm forestry, all we do is to follow her in planting our trees close together and in masses enough that the sun and the wind may be shut out as soon as possible. The moisture that falls among the trees is thus preserved for their use and not lost by evaporation.

This is really the whole secret of successful Forestry on the Prairie.

Other considerations of course enter in, and of the most important is economy.

AIRCRAFT FOR FORESTRY SERVICE



large
in a short time. In
of the fact that on more than half the days adverse weather conditions made aerial observation impossible, the foresters were able to map in the broad forest types on 1,800 sq. miles in the three weeks they were operating around lake Timiskaming. It is estimated that to secure th same information on the ground it ould have taken two men upwards of eight months. It is hoped that through the co-operation of the Air Board, a much more extensive aerial survey of the forests of Northern Ontario will be undertaken next summer.

When flying over Timagami lake it was possible to see both lake Nipissing and lake Timiskaming which are ninety miles apart. From this point, several small fires, evidently settlers' clearing

The above is Reproduced from Page 517 of the December, 1920, issue of Canadian Forestry Magazine.

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MANUFACTURERS OF COMMERCIAL AIRCRAFT IN THE CITY WHICH WAS THE BIRTHPLACE OF AVIATION.

We may use too many trees and waste money in unnecessary purchase of plants, and in planting. Or we may use too few trees and waste time and money in unnecessary cultivation after the trees are planted. And so we use the golden mean, which we find by experiment is to plant the trees 4 x 4 or 4 x 6 feet apart.

Windbreaks One-Hundred Feet Wide.

After they are planted, we conserve the moisture for their use at first, by cultivating the soil as in a summerfallow. This goes on for three or four years till the branches and leaves get close and dense enough to protect the ground from sun and wind as in the natural bluffs, after which the plantation becomes self-sustaining and needs no further cultivation.

The width of the plantation should be about six rods, or 100 feet, to throw the wind over thoroughly and completely.

These are the principles on which a farm forest should be built, but there are other two very important matters to be considered also.

These are, 1st. Rapid results, and second, permanency.

A farmer's first object in planting, naturally is shelter and so we expect quick height growth in our plantation. We can get this by using a quick growing variety of Russian Poplar.

But quick growing trees are usually short lived and so we mix with them a certain proportion of Ash and Elm, and under certain conditions, Spruce or Pine. These are all long lived trees and will go far to give us the permanency we desire. Mixed in definite proportion with the Russian Poplar, we can at the same time secure the rapid height growth we want.

To assist in sheltering the ground quickly and so cutting down the cost as we have seen, we use with this mixture a great many Manitoba maple or Box Elder, and Caragana. These are branchy and have much denser foliage than the others and their function in the plantation is to shade the ground.

In some parts of the country the maple is not entirely hardy and will rarely grow into a tree, but none-the-less it should be used as part of the mixture in all such plantations. Its value lies in its ability to shade the ground and so preserve moisture for the use of better trees than itself.

Caragana is a very bushy shrub and its best services is rendered by two rows being planted on the outsides of the plantation to keep out the wind and withstand any grass that may work in.

Seedling plants are the best to use. More of them live and they are cheaper.

The accompanying diagram shows how the trees should be mixed.

Planting Diagram.

The outermost rows of Caragana should be six feet from the edges of the plantation.

The trees to be 4 x 4 feet apart.

C C C C C C C C C C
C C C C C C C C C C
M M M A M M M E M M
R R R R R R R R R R
M E M M M A M M M E
R R R R R R R R R R
M M M A M M M E M M
R R R R R R R R R R

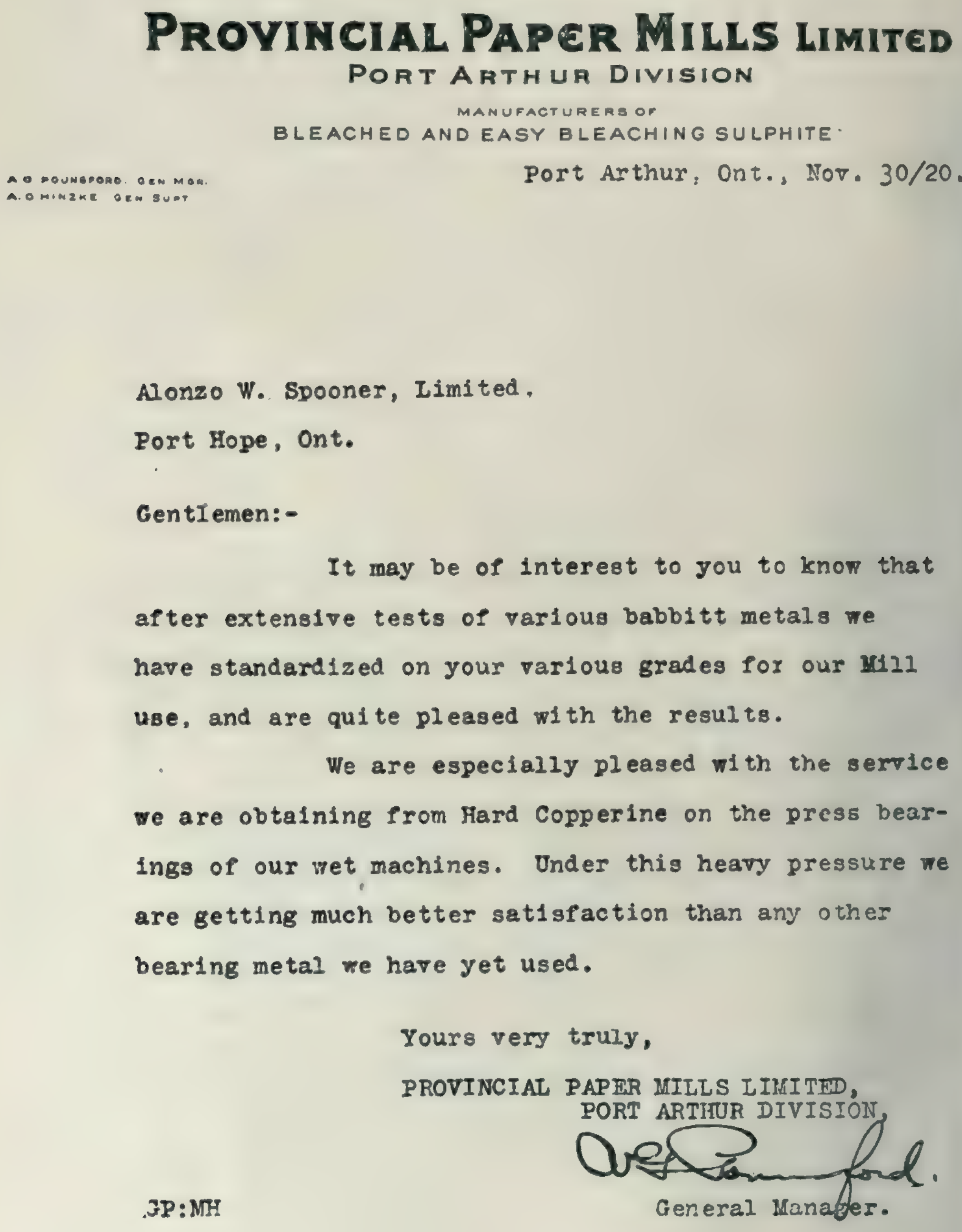
And so on alternately. The two outer rows should again be Caragana.

C—Caragana.
M—Manitoba Maple or Box Elder.
R—Russian Poplar (Populus Petrowskiana).
E—Native Elm.
A—Native Ash.

You will see every other row is Russian Poplar. These are grown from Cuttings and planting them is done with a spade and is a speedy job. A man can easily do 2,000 a day.

The other rows are mostly Maple, three-fourths Maple and the balance Elm and Ash.

You will also see, every other tree is crossed off. This is to allow for thinning, which will take place 20 or 30 years after planting. This seems rather far fetched, but Foresters have to look far ahead in the management of their crops, and the thinning must be taken into consideration. The actual thinning will not work out exactly according to the Diagram, for some trees will be dominated by the others and will die, but in the main the Diagram will work out when the proper time comes to thin.



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No thinning should be done before 20 or 30 years, for the opening up of the crown of branches will allow the sun and wind to get in and dry out the ground if it is done too soon.

At that age the leafy canopy will be 30 or 40 feet high and will still afford sufficient shade for the plantation to maintain itself.

Prunning will be attended to by nature herself. The lower branches will die and drop off for want of light, and the trees will grow smooth and clean without the owner ever having to touch them with a knife.

Preparation of the Land Before Planting

Before trees are planted on the Prairie, the land must be prepared the year before. Deep plowing in May or June when there is moisture still in the ground to preserve, followed by careful cultivation during the summer, makes an excellent preparation.

Sod should be broken and worked up two years before planting to trees. We have seen that the elimination of moisture waste is of the utmost importance in Prairie Forestry and as grass is a great moisture user, every small shoot of grass that is seen the first year or two in the plantation should be at once dug up and destroyed. This is very important, and especially so on sod land, for sometimes there are little spears of grass roots that are not rotted and they may soon spread and take possession of the plantation, when the trees of course will suffer, and may even in time, die.

If a plantation or any part of it does get over-run with grass, a good heavy mulching of straw or manure should be applied about the month of June. This will rot out the grass and help to conserve the moisture at the same time.

These, then, are the principles of Forestry as applied to Prairie planting. It is all a matter of moisture. We get sufficient to grow trees if we can only save it.

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making to re-clothe the Prairie with trees all along the edge of the tree line. All we have to do is to follow her methods.

The greatest causes of moisture loss are the shining of the sun and the blowing of the wind and we know that by planting broad belts of trees with the trees close together, we can counteract these.

The drifting of the soil in the last few years has shown us that trees on the farm are no longer merely an advantage; they are a necessity, and the day of systematic Farm Forestry is here.

Just think! It is only 20 years or less since the bare prairies of Saskatchewan and Alberta began to be settled, and in many districts already, the top soil is nearly all blown away.

The top 8 to 12 inches of soil is the fertility of the farms, the source of the wealth and well being of the people on the Prairies.

Providence in His wisdom took thousands, perhaps millions of years to lay down that twelve inches of top soil and here we are, in less than a generation, allowing it to blow away.

And what is one generation on the life of a nation? Another 20 years at the same rate and there will scarcely be enough good soil left to be worth while protecting. Surely now is the time for us to set our hand in earnest to this matter.

But even without this soil loss, the Prairie, bare for ever, and yet settled with people, is unthinkable. It will have to be planted some time anyway.

Let us plant it while we still have something to protect. Belts of trees across the farms will check the force of the winds, will protect the soil, the stock, growing crops in all stages from the seed to the harvest, and will prevent the loss of moisture by holding the snow on the ground in winter and checking evaporation in summer. Homes will be more comfortable, and the whole aspect of the country will be immensely improved.

Forests are said to be nature's balance wheel. They will prove no exception on the prairie.

ARCHIBALD MITCHELL.

The above article by Mr. Archibald Mitchell, Western Lecturer of the Canadian Forestry Association has been adopted by the Junior Branch of the United Farmers of Alberta for their educational programme.

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Picture of Monarch Tractor Pulling Load of Logs Through Heavy Snow in Lumber Camp

Good Shingles Not a Fire Menace

by Frank L. Nash, Secretary Shingle Agency of B.C.

AT the recent meeting of the Ontario Fire Prevention League held the first week in October, J. B. Laidlaw, manager of the Norwich Union Fire Insurance Society, addressed the league on the subject "The Fire Menace of Wooden Shingles." At the conclusion of his remarks he offered the following resolution:

"That the Ontario Fire Prevention League request the Legislature of Ont-

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ario to pass an act, to be of general application in every part of the Province, and with no exceptions, to prohibit the use of wooden shingles or other combustible material as a roof covering on any building hereafter erected nearer than fifty feet to an existing structure, and to prohibit the extensive repair of any existing roof covering composed of wooden shingles."

This is just another instance of the many attempts by certain interests to eliminate the wooden shingle as a roof covering. In spite of this fact the number of cities having anti-shingle ordinances throughout the United States and Canada remains about the same, (stated in Mr. Laidlaw's address as being 91, which is approximately correct), for as often as one city decides to experiment with an anti-shingle ordinance some other city will repeal one which had formerly been passed, but had not produced the desired results, that of reducing the fire losses.

There are many cities that have passed anti-shingle ordinances only to repeal them at a later date. There is another class of cities that have investigated the question, and have passed common sense building codes, in which they permit of the use of vertical grain, or quarter sawed shingles, in which the shingles must be 5-2" in thickness at the butts. These shingles will lay flat on the roof and will not curl up at the edges, allowing places where inflammable material may accumulate. The fact is that such shingles are the only shingles that should be used for roofing, as they give better satisfaction and last longer.

The public is often willing to take for granted reports made as to the origin of fires without giving careful thought as to whether or not the case had been carefully diagnosed and the real cause found. This condition has been known to exist, and in many cases the shingle has been blamed in reports of fire causes as "Sparks on Shingle Roof" when the cause should have been reported as "Defective Flue," or as "Sparks from Chim-

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ney," which was due to the burning of soot in unclean chimneys.

Examination of the report of the State Fire Commissioner of Texas, dated February 14th, 1917, indicates that had the chimneys been properly constructed and cleaned, and buildings properly fire-stopped, the 1568 "Unpreventable Fires" attributed to "Sparks on Roofs" would have been reduced to a minimum.

The National Board of Fire Underwriters in their statement of fire losses in the United States for 1917 place the total at $231,628,040 and in 1918, $283,103,101, or a total loss in two years of $514,785,141, with a total of fires caused by sparks on roofs of only $13,682,423 for two years, or a percentage of 2.66 per cent. which could not at least all be attributed to wooden shingles.

Some of the worst conflagrations and heaviest losses have been in the fireproof districts, as the National Fire Protective Association says in one of its publications "It is the frequent conflagration in a business district where the commercial values are greater which make the fire tax in the United States so enormous," and in these congested districts wooden shingles are seldom found, and never recommended for such use. Take the much talked Atlanta, Ga., conflagration. This fire started in the business district, burned out to the residence district, and was stopped in a shingle roofed frame constructed house.

When an overwhelming majority of all large cities in the United States and Canada permit the use of wooden shingles within their corporate limits, outside of the congested districts, it is proof that the advantages of the wooden shingle roof in residence districts are still recognized. It is also proof that the general public desire an opportunity to make their own choice of the roofing material they shall use, for there are many who advertised forms of roofing, claimed to be "fireproof or "fire-resistant." To the public the words are generally synonymous—that is combustible.

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A few years ago an anti-shingle bill was introduced in the legislature of Texas, prohibiting the use of wooden shingles within the State. This Bill was killed in committee simply in response to prompt public remonstrance. At the public hearing of the committee, the effort to defend the bill was very feeble, and no minority report was made, which would seem to indicate lack of proof that wooden shingles are really objectionable.

It is obvious from the above facts, and statistics show, notwithstanding statements to the contrary, that wooden shingles have contributed but a very small amount toward the spread of fire over large areas, or that a roof of good shingles is a fire menace.

The Pulp and Paper Magazine publishes the following as a "Creed" suggested by Dr. C. D. Howe, of the Toronto Forest School.

We believe in a wholly softwood forest.

We believe in fir, pine and spruce, and that the greatest of these is spruce.

We believe our country has the largest and most prolific pulpwood producing forests in the world.

We believe the forest is not dead, inert material like a mine, but is a living growing thing that can be continuously utilized and at the same time concontinuously restored to productiveness.

We believe the lack of consciencious effort in forest culture and forest protection will in the end be quite as disastrous to our country as the lack of similar effort in field culture.

On the other hand, with the application of intelligent methods of conservation and recuperation, we believe our forests could supply the wood-pulp and paper requirements of the world.

We believe in the development of home industries and therefore that it is unwise, illegal and uneconomical to allow the exportation of raw materials in large quantities from our country.

We believe in the power of falling water, and we believe its power should be greatly extended throughout our land that we may be less dependent upon the indirect source of power imported from without our borders.

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We believe in up-lifting in all our endeavours, not in tearing down, and hence that it profiteth neither men nor nations to tear down what they cannot replace with better.

We believe in Canada.

We believe in ourselves.

We believe in the quality of our products.

We believe the blessings of our fellow citizens, the blessings of our children and of our children's children for all time will rest upon those who accept this Creed—and act upon it.

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Is There a Substitute for the Spruce Log

THE comparative scarcity of pulp for paper-making and the consequent high prices for newsprint are reflected in the stimulus given to research all over the world in an endeavour to widen the field of raw material for paper manufacture. A brief review of some of the possible competitors with Canadian spruce and balsam may be interesting.

Esparto is a grass-like plant found in Spain, Algeria, and Tripoli. It was used for paper-making in Great Britain as early as 1857. During the war, the scarcity of other sources of pulp gave it greater prominence. The fibres are short and weak, and the pulp is best used for filling and is employed largely in mixtures with longer and stronger fibres. In papers in which considerable strength is needed, not more than 20 per cent. of esparto can be used.

Zacatan is a plant belonging to an American genius of the same family as esparto. It is principally found in Mexico, where it grows profusely in certain regions. Experiments with this material,conducted by the Bureau of Plant Industry of the U.S. Department of Agriculture, showed that a satisfactory paper could be made from it by means of the soda process. Indeed, the report of the investigation was published on paper made from zacation. The experiments were not, however, conducted on a scale sufficient to make any estimate of the cost of manufacture. At present, zacaton is a waste product and flourishes in a region remote from paper-manufacturing sections.

Hemp hurds have also been investigated by the Bureau o fPlant Industry. After several trials, under conditions of treatment and manufacture regarded as favourable in comparison with those used for pulp-wood, paper was produced which received very favourable comment both from investigators and from the

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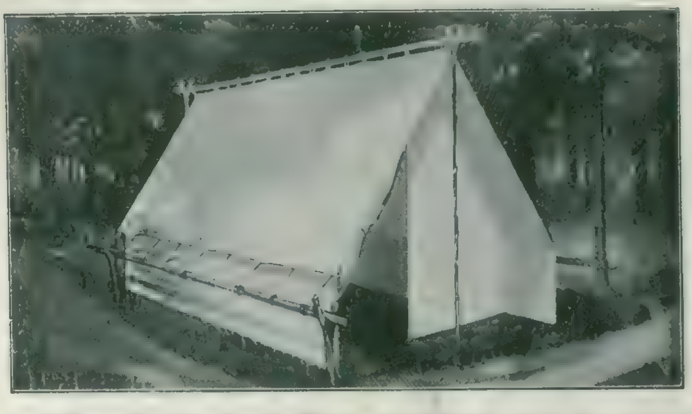

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trade, and which, according to official tests, would be classed as No. 1 machine-finish printing paper. The quantity available is not great, however.

Flax straw and tow may replace imported flax-waste in the manufacture of wrapping and writing paper. If this can be done, a market would be furnished to Canadian farmers for disposing of what is now a waste product.

Bamboo is coming to the fore in India and Burmah. Mr. William Raitt, consulting cellulose expert to the Indian Government, states that there remain no practical difficulties in transforming bamboo into pulp. Bamboo has the great advantage that it renews itself annually, whereas pulpwood takes half a century to grow.

Tropical reeds and grasses found in the Nile "sudd" of the Bahral-Ghazal province of the Sudan have been experimented with for paper-making, and, while complete success has not been attained, it is quite possible that the difficulties will be eventually overcome. The supply is unlimited.

Anhingo, a plant growing along the banks o fthe sluggish rivers of the state of Para, Brazil, is stated to be an excellent paper-making material, but the great profits to be obtained in the rubber industry have hitherto hindered its exploitation. Mills are now, however, being put in operation for the utilization of this fibre.

Ajimo is a seaweed found in Japon. It reproduces itself in less than six months. It is said that paper can be produced from it at much less cost than from wood, and a Japanese company has been formed for the purpose of turning out ajimo paper.

Jack-pine is a promising material in the paper-making field. As jack-pine is very common in Canada's northern hinterland, the commercial exploitation of this species would prove very valuable to supplement our dwindling stocks of spruce and balsam.

In the manufacture of newsprint wood-pulp still dominates the field, but one dare not predict that this will always, or even will long, be so. In the temperate zones, however—and proximity to the world's industrial centres is an important factor—there appear at present no serious rivals to our great pulpwood forest species.

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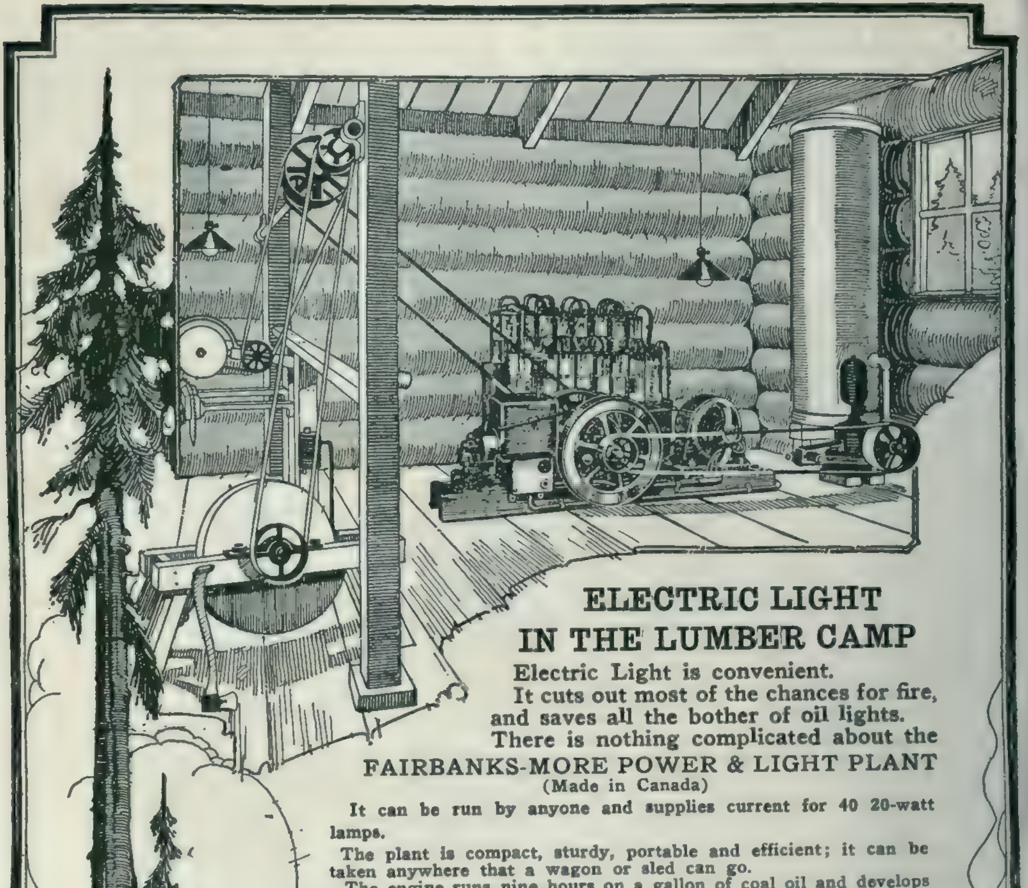

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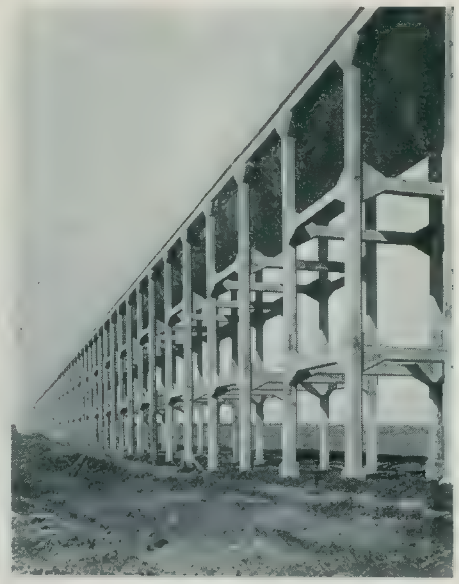
The Brooks Aqueduct of Alberta



PART of the water which reaches Lake Newell reservoir after its 30 mile course from Bassano through east branch canal, feeds the Bantry canal, which irrigates 135,000 acres of land. About 2 1-2 miles beyond the lake it is necessary to carry the water across a long flat valley on the summit of the watershed between the Bow and the Red Deer rivers. This is accomplished by a reinforced concrete flume known as the Brooks Aqueduct, completed August 31st 1914. Its construction marked an interesting departure in the matter of water transportation. It is the first aqueduct in which the hydrostatic catenary, or elastic curve, has been adopted for the shape of the water section. This form was chosen as the most suitable, as it gives a maximum hydraulic radius for the given area, and a consequent low friction head. Structurally it is very economical since, when full, the shell is in simple tension, free from sheer and bending moments. Mr. H. B. Muckleston, assistant Chief Engineer, Department of Natural Resources of the Canadian Pacific Railway, is responsible for the adoption of this unique design.

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the venturi tube. This design required less excavation under the tracks and assured better drainage. The gradual expansion of the section as it rises at the outlet is similar to the descent, the water entering the flume again at the same velocity with which it enters. The prevention of eddies and consequent loss of head in the syphon in addition to provision for hydrostatic pressure, and the usual stress and moments, led to some interesting details of design, arising out of an extensive preliminary investigation. When the water was turned on last September the syphon remained perfectly watertight under its full pressure.

In the construction of the Brooks Aqueduct some 25,000 cubic yards of concrete and about 4,000,000 pounds of reinforcing steel were used.

The Bassano Dam admits water to the eastern section o fthe Irrigation Block from the Bow River at Bassano. The sills of the canal head gates are about 34 1-2 feet above the previously existing level of low water in the river at this point. The dam raises the water an additional 11 feet above these sills, enabling the system to command a much larger area of land than it otherwise would, and reducing the quantity of material that had to be removed from the main canal cut, by a considerable amount.

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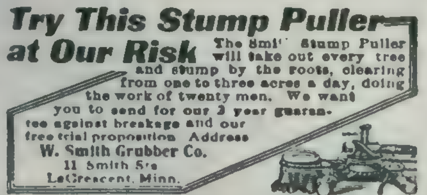
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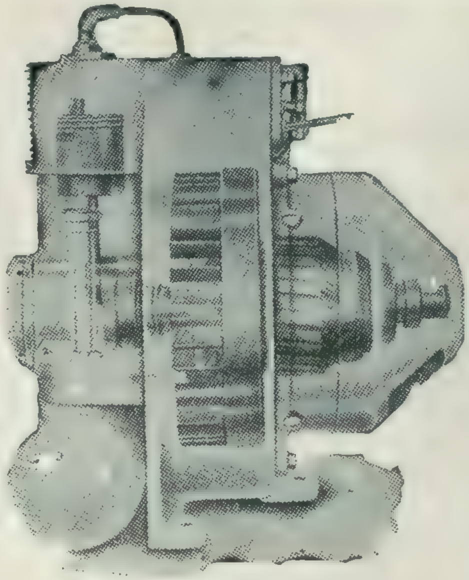

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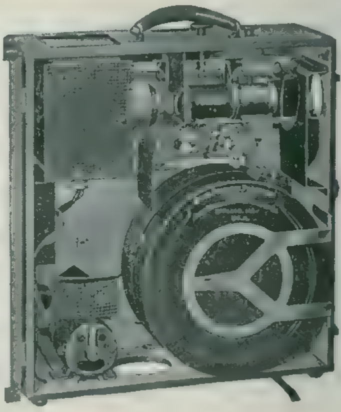

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cultivate them. These are instances of conditions where tree planting might be the means of converting land, at present worthless and idle, into valuable and revenue producing property. As farm lands in the West become more thickly settled, a farmer to be successful must make every acre of his property produce the greatest possible revenue without deteriorating the soil. In the case of spots unfit for grain cropping, there is no doubt that the only way to obtain a revenue from them is to plant them with trees. There may be an odd case where, owing to the presence of alkali in the soil or from some other cause, trees would not live, but such instances are very exceptional. It is true that for a few years after planting no revenue can be obtained from a plantation, but the initial expense is not so very great, and as an investment such planting would pay good interest in the future; the only alternative is to allow the ground to remain unproductive for all time.—**Norman M. Ross.**

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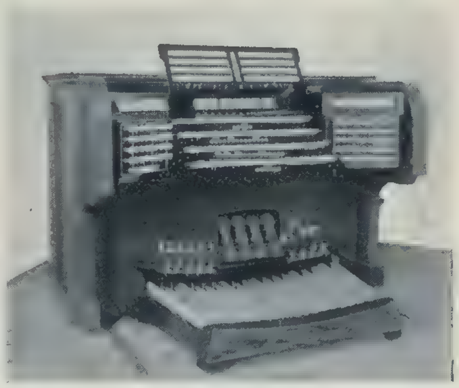
Address all communications to Suite 224, Jackson Building, Ottawa.

Turning the Tree Into a Pipe Organ

By G. Gerald Blyth,
Assistant Secretary, Canadian Forestry Association

A Piece of Manufacturing Magic in Which Canadian Materials and Men have Established World Standards



The "console" of a modern organ showing the four manuals, pedal keyboard, stops, combination buttons, balanced swell pedals, etc.

WOOD enters very largely into the manufacture of most musical instruments but the amount and the variety of species used is not generally appreciated by the average individual. In an article published in a recent issue of the Canadian Forestry Magazine the writer described the manufacture of pianos and attempted to show how the different kinds of woods enter into their manufacture. It is the purpose of this article to give our readers an idea as to the extent to which wood is used in the building of our large Church organs and to trace its use in this connection from the first stage to the finished product.

Wood has always been extensively used in organ building but with the development of the organ (to the present day four and sometimes five manuals, together with pedal, containing from 75 to 100 speaking stops, and even sometimes more) the amount of wood used is much greater.

The modern organ is composed of several units or separate organs each of which is complete in itself and is capable of being played separately or in combination with the other units. They are as follows:—"Pedal," "Choir," "Swell," "Great," "Solo" and in the very large organs sometimes an "Echo" organ is included. Each organ, except the "Great" is entirely enclosed in sound-proof cases known as "Swell" boxes which are fitted with shutters. Unlike a piano where the keyboard is attached to the instrument, the keyboards or manuals and pedal keyboards in most organs, together with all the controlling devices, are built in a separate unit known as the "Console" and may or may not be attached to the instrument. As nearly all our modern organs are controlled either by pneumatic or electro-pneumatic action, the "Console" may be located in the most suitable position which may be any distance from the organ to which it is connected by electric wires or lead pipes. Figure 1 shows a four manual "Console" and Figure 3 the exterior of an organ. We might build the largest and most costly organ but in order to play it we must furnish it with the necessary breath or wind to make it speak, so the next most important feature is the blower-fan which furnishes the wind. The constructional details of this and the other portions of the organ will be dealt with later.

Our largest organ building establishment, that of Messrs. Casavant Freres Limitee, located at St. Hyacinthe, employs between 175 and 200 men all the year round and has built to date in the neighborhood of 900 organs varying in size from the small Chapel organs to the mammoth five manual organs which cost anywhere from $50,000 to $100,000. The average 4 manual organ requires between 20,000 and 25,000 feet board measure of lumber to construct it and the total annual consumption of wood by this one organ building firm is about 500,000 feet board measure of all species. The following are the different kinds of wood which are used:—

Oak, Pine, Basswood, Spruce, Poplar, Mahogany, Maple, Ash, Birch, Elm, Chestnut, Butternut, Beech, Black-Walnut, Ebony, and Rosewood or 16 species all told. Some of these species are used entirely on the exterior and others in the interior.

Table showing the principal woods used in order of amount consumed:—

Interior.

1. Poplar or Whitewood.
2. Pine.
3. Basswood.

In Cases and Consoles.

1. Oak.
2. Basswood.
3. Ash.

Before showing which species enter into the make-up of an organ let us first see what are the principal parts of an organ:—

Exterior.

1. Case.
2. Console—(a) Frame.
    (b) Drawstop action.
    (c) Keyboards.
    (d) Switchboard.
    (e) Couplers.
    (f) Combination pistons.
    (g) Other accessories.

Interior.

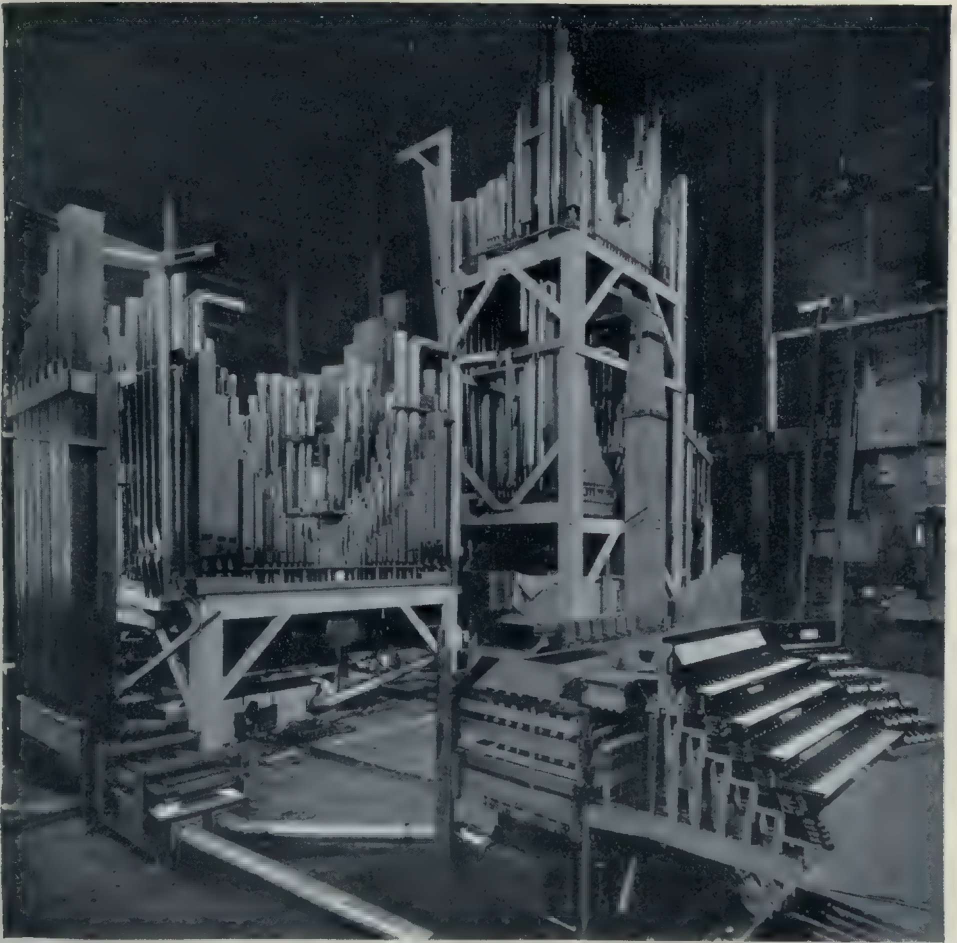
1. Frame—(a) Main Organ.
    (b) Rests or frames for big pipes.
2. Chests—(a) Main chests.
    (b) Pedal chests.
    (c) Auxiliary chests.
    (d) Drawstop boxes.
3. Pipes— (a) Metal.
    (b) Wood.
4. Swell-boxes—Fitted with shutters.
5. Wind Supply—
    (a) Blower.
    (b) Wind Reservoirs.
    (c) Wind Trunks.
    (d) Concussion bellows on path of wind which serve as regulators.

To those entirely unfamiliar with organs it will be necessary to briefly describe the function of each of the principle parts mentioned above. As the primary object of this article is to show what woods are used in constructing an organ, it will not be possible to describe very fully the construction or function of the many complicated portions.

The Exterior.

1. *The Case.*—Figure 3 is a good illustration of an average case. It is usually of an artistic design. The necessity of a case will be observed on referring to Figure 2, where we have an organ, practically completed, but minus the case.

2. *The Console.*—The Console of an organ is like the switch-board in an electric power-house as it controls the entire



What a pipe organ looks like before the casing goes on. Our picture shows the interior of a four manual organ showing arrangement of pipes. The organ is completely erected in the factory, tested, and then all taken down and crated for shipment.

organ, every pipe in which is connected either electrically or pneumatically with the manuals. The console is a highly complicated piece of mechanism, too intricate in fact to receive a detailed description in an article of this kind.

By the manipulation of any stop or combination of stops on the console desired, wind is automatically admitted to the wind chest which supports the particular set or sets of pipes. However this is only a preliminary action as no wind is admitted to the individual pipes until a key on the manual is depressed. The same is true of the pedal keyboard or manual. Figure 1 is an excellent photograph of one of the most modern consoles in existence.

The Interior.

1. *Frame.*—The entire organ is built up in heavy frames which support the main organ and act as rests for the big pipes, chests and swell-boxes.

2. *Chests.*—The Chests are made of wood and are long boxlike things whose chief functions are to support the pipes and distribute wind to the pipes.

3. *Pipes.*—A modern organ contains several thousand pipes, most of which are made of wood, which range in size all the way from a tiny pipe a few inches high to

The final form of the tree in its journey through the factory: A beautifully decorated organ case.

the great pedal pipes which are often 32 feet in length.

A stop on the console represents at least 65 pipes and sometimes 68 or 73 pipes. On the pedal, a stop represents 30 or 32 pipes.

Some idea of the size of the pedal pipes may be obtained from the following:

The Open Diapason are on the average, 16 inches x 19 inches x 16 feet long. Three inch deal is used to construct the huge 32 feet pipes which often weigh over 1,500 pounds and are 32 inches x 38 inches x 32 feet. These latter are known as Double Open Diapason and belong to the Pedal Organ.

Wooden pipes seem to produce a better and mellower tone than the metal ones for certain species of pipes and are extensively used throughout the entire organ.

4. *Swell-Boxes.*—All the organs, excepting the "Great" are enclosed in sound-proof boxes made of boards, between which is placed seaweed to deaden the sound and an air space is also left between the boards which constitute the envelope. The boxes are fitted with shutters which open and shut at the organist's will, he simply having to press a balanced swell pedal. The opening and closing of the shutters gives a swelling or diminishing effect to the sound which very greatly adds to the tonal effect. The swell boxes are of course hidden out of sight entirely or as much as possible, by the case or by a few pipes which ornament the exterior as shown in Figure 3

5. *Wind Supply.*—As has been stated before, an organ is useless unless it has a supply of wind and the supply must be adequate and regular. Wind is produced by a blower which is similar to a centrifugal pump and is encased in a wooden or metal box. The wind passes from the blower to wind reservoirs through trunks and then to the chests and later to the pipes when the action of the stops and keys causes wind to be admitted to them. Concussion bellows are usually located on the path of the wind which serve as re-

gulators. The proper and quick distribution of wind to all parts of the organ is a very important and necessary feature and much depends upon the successful distribution of the wind supply.

Having mentioned the principal parts of an organ and briefly described the function of each let us now see what woods are used in their construction:—

What Woods are Used and Where.

1. *Oak.*—White Oak—Red Oak.

The two varieties above mentioned are the ones most frequently used for exterior portions of organs such as the case and the console. Oak has an exceedingly attractive appearance and is largely employed for decorative purposes. The Oaks are of very great importance commercially because of the high technical qualities of their wood and it is to be regretted that in Canada the supply is nearly exhausted.

2. *Pine.*—White.

It is not surprising to find the most important lumber tree in Canada being used extensively in the building of organs. The wood is soft, easy to work, easy to season and once properly conditioned, holds its shape as well as any other coniferous wood known to commerce.

Pine is extensively used in making the following parts of an organ:—

(a) Pipes—used on account of its tonal qualities.

(b) Reservoirs—used in making these because it is easy to work and does not readily split.

(c) Blowers—The envelope and partitions are almost invariably constructed of Pine.

(d) Frame-work.

(e) Keys—The body of the keys is usually made of Pine.

(f) Swell-boxes—Both the frames and shutters are constructed of Pine as a rule.

Red Pine is often used in building the frame-work owing to its strength and hardness.

3. *Basswood.*—This wood is very extensively used throughout the entire organ, principally owing to the fact that it is easily worked, and also because it possesses the quality of holding its shape better than many other woods, after seasoning. The following is a list of those parts of an organ in which Basswood is very largely used:—

(a) Case (Both organ and console).
(b) Concussion bellows.
(c) Underboards of wind chests.
(d) Drawstop boxes.
(e) Reservoirs.
(f) Sometimes for blowers.
(g) Curtain boxes and other similar parts.

4. *Spruce.*—White, Red, Black.

Spruce is not as extensively used by any means as Pine but the above varieties are often used.

White Spruce is employed in making the large 16 and 32 foot pedal pipes, when obtainable in the dimensions required. White Spruce is also used in the smaller pipes to a large extent.

The Red and Black Spruce are sometimes used in constructing the frame but when Spruce is used in the construction of Swell-boxes, it is always the White Spruce that is selected.

5. *Whitewood or Poplar.*

Whitewood or Poplar is very largely used in building organs as it is one of the most adaptable of woods. The Whitewood used, is mostly imported as the tree is not common in Canada. Many of the small mechanical parts of an organ are made of this wood and the following list shows a number of other portions of an organ where it is employed:—

(a) Wind chests (Both main and pedal).

(b) Large pipes.

(c) For all the mechanical accessories such as:—

  (1) Drawstop Boxes.
  (2) Auxiliary Chests.
  (3) Numerous pneumatic motors.
  (4) Switchboard of tubular organ.

6. *Maple.*—Sugar Maple and Silver Maple.

The Sugar Maple is perhaps used more extensively than any other variety of this species as it possesses the qualities of hardness, strength and stiffness to a greater degree than any of the other species.

Silver Maple is sometimes used when the Sugar Maple is unobtainable, but it is inferior in many respects as it is not so strong as that of the Sugar or "hard" Maple.

The principal uses to which the Maple is put in organ building is in the construction of the following and especially in those parts where minimum warping and maximum strength is required:—

(a) Pedal keys.
(b) Anything that belongs to combination racks.
(c) Drawstop rods.
(d) Special pipes.
(e) Contact rollers of the electric switch-board in electro-pneumatic organs.
(f) Coupling bars of electric switch-board.
(g) Dowels—To hold parts together.

NOTE.—Wooden dowels are very freely used in constructing an organ as they can be more readily used in the less accessible places than nails or bolts. They cost less, have great strength and the ease with which they can be used in different other parts too numerous to mention, makes them a valuable instrument.

7. *Ash.*—Black, White, Red and Green.

The Black and the White Ash are more extensively used than the two other varieties which latter are used as substitutes for White Ash when it is not readily obtainable.

For all exterior work, plain or decorative, on the case or console of an organ Black Ash is the variety most employed. in addition Ash is used for the following:—

(a) Frame-work.
(b) Swell-boxes (The skeleton frames of which are often made of this wood).
(c) Pedal-board and bench, if console is of Ash.

Birch.—Paper and Yellow.

The wood of the Paper Birch is soft and tough. It is also compact and easily worked. Birch is the most important hardwood sawn into lumber in Canada and Yellow Birch forms the greater part of the Birch lumber produced. This wood is used extensively throughout the organ and the following list will give the reader an idea as to the extensive use made of same:—

(a) Cases (both organ and console).
(b) Frames for pedal boards.
(c) Special pipes.
(d) Frames (Extensively used)
(e) All the frames of the console.
(f) Small pneumatics of the auxiliary chests.
(g) Blocks on caps and pipes.

9. *Beech.*—

This wood is very little used in organ building but when it is, it is most suited to the mechanical parts.

10. *Elm.*—White.

Elm is often used in the cases, but more frequently the lower grades of this wood are used for crating the organs for shipment.

11. *Chestnut.*—

Chestnut is often used, when obtainable, for the case and for the exterior of the console. The close grain of this wood and texture causes it to take glue well.

12. *Butternut.*—

This wood is used in making cases for organ and console. It is also used throughout the mechanism, where trueness of shape is necessary. Butternut constitutes the foundation of most of the veneer used at the organ building establishment visited.

13. *Black Walnut.*—

Black Walnut is an exceedingly beautiful wood and its popularity for fine cabinet work, etc., has resulted in the almost commercial extinction of the tree in America. It is only used in the visible exterior portions of the organ and console.

14. *Ebony.*—

This tree is not indigenous to Canada, but according to "Sargent" it is common in the bluffs of the Gulf Coast and on both banks of the lower Rio Grande. South of the Rio Grande it is one of the commonest and most beautiful trees. The wood is used for the black keys of the manuals and pedals and for stop nobs. It is also used for delicate moulding in the panelling of the case and console.

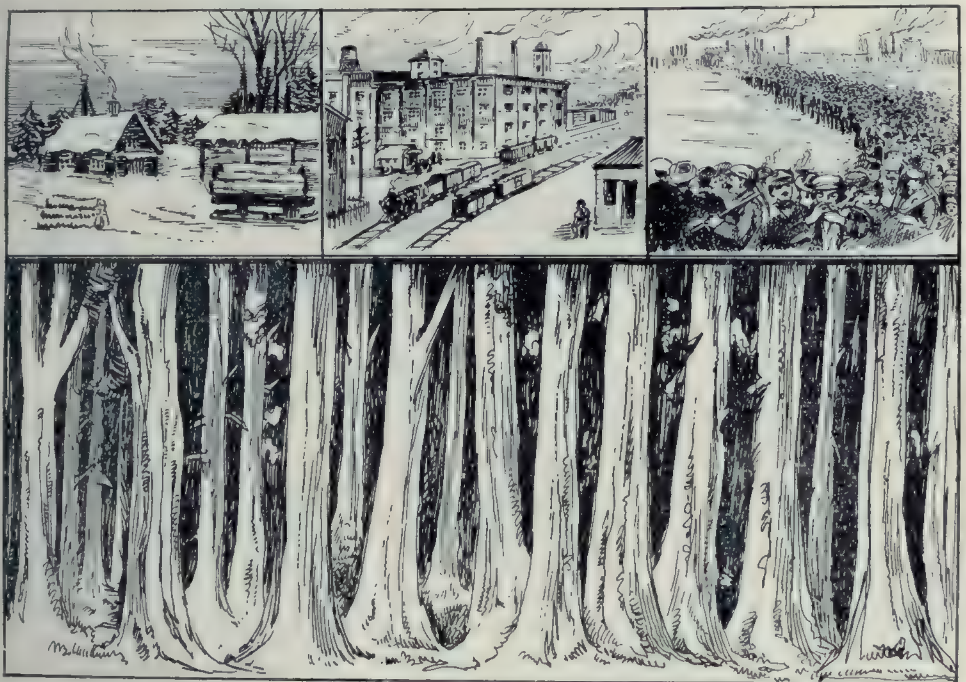
15. *Rosewood.*—African.

This is a tropical tree and consequently all the Rosewood used is imported. The above variety which grows in Africa is the true Rosewood but in the tropics almost any dark colored wood is known as Rosewood. About the only place where this wood is used is for stop nobs.

16. *Mahogany.*—

Is used for the jams (facing around stops) on console; for the envelope of case of console, fronting and sometimes the entire organ case is constructed of this beautiful but costly wood.

Of the sixteen different kinds of wood above mentioned as being used in organ building it may be of interest to note that thirteen are indigenous to Canada.



The Prosperity of Canada rests its weight upon tree trunks.

Kick out the Forest Prop and no Canadian industry can long survive. The security of the forest means the security of employment, the security of factory production, the security of farming, mining, fisheries, lumbering and the vast industry of pulp and paper. The Forest is the Mother of Civilization.

Tree Seeds for Great Britain.

In response to requests from forestry authorities in the United Kingdom tree seeds were collected in British Columbia by officers of the Dominion Forestry Branch. These were forwarded to the Forestry Commissioners for Great Britain to be used in the carrying out of reforestation plans under way in the United Kingdom. The seeds included those of Douglas fir, Sitka spruce, alpine fir, and of other species which the British authorities desire to test.—Annual Report, Director of Forestry, Ottawa.

A real home on the prairie. Trees shelter the orchard and garden and attract feathered friends.

Attracting Birds to the Prairie Home

By Hoyes Lloyd

WHEN the white man first crossed Western Canada he found a great deal of the country practically treeless. Perhaps these plains were looked upon for so long as unsuitable for cultivation because they grew no trees. An easterner, while admitting the fertility of these plains, often shuns the thought of living there in spite of prospects of wealth because the level monotony of the prairie had not the same appeal to him as has a partially forested country.

On the treeless prairie, with its lack of shade, the home however well-built, has not the beautiful setting that a grove of trees would make for it. Even the camper on the prairie who usually pitches his tent where dark overtakes him will travel many miles and be late in getting his evening meal in the hope of finding a clump of trees or even a few prairie shrubs such as wolf willows to shelter his frail home.

Some of the important reasons for planting trees are often emphasized; trees are beautiful, and they are useful. A sheltering belt of trees about the house breaks the hot dry wind of summer and the blasts of winter alike The kitchen garden protected by a shelter belt from the prairie winds will not be blown out by the roots and is bound to be a greater success than the unprotected one.

Fortunately the foresters have selected a variety of trees that will make this welcome shelter and many are the homes on the prairies that are now improved in this way.

The wild fruits of the prairie are found in the shelter of the coulees—the cultivated fruits—apples, currants, strawberries, and all are grown only in the shelter of planted trees.

There is one advantage in tree planting that has been overlooked. The prairie has its own peculiar bird life. It is the home of the Longspur, the Horned Lark, Sprague's Skylark the Western Meadowlark and many

Where the song bird nests in the cool shade of planted trees near a prairie home.

kinds of native Sparrows. The Vireos, Warblers, Thrushes, Chickadees, most of the Flycatchers, most of the Woodpeckers and many other valuable insect-eating birds and arboreal. They nest in or among trees and as a rule are seldom found far from their shelter.

The garden on the prairies which is guarded by trees will also be protected from many pests by the insect-eating birds which the trees have attracted. So in addition to the other economic and aesthetic value of the trees themselves, they serve to attract valuable birds to the gardens where their work is needed.

Birds travel a considerable distance for food and once they are established their insect control will be extended to neighbouring field crops as well as to the garden.

As the trees grow they will provide nesting sites for other highly desirable birds, such as the Ferruginous Rough-legged Hawk and Swainson's Hawk which spend most of their lives in hunting that pest of the prairies, the gopher. Their skill in this respect is reflected in the popular name of gopher-hawk, by which these two species are known throughout the West. The efforts of a pair of these birds in ridding the farm or ranch of gophers continue throughout the summer, and make such faithful allies worthy of every protection, especially when it is considered that they probably never take chickens .They will use trees as nesting sites, and the place where they take up their dwelling will be rid of any gopher pests before they rear their family. The staple "gopher" always ranks high in importance in the food of adult and young. Mr. P. A. Taverner estimates the cash value of one pair of these large hawks at $77 per year. If they use your tree plantation for a nesting site, this should be remembered.

The songs of birds about the house will be increased by tree planting. Our prosaic friend the Robin will not stay in treeless regions, and will eat no cut-

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1. The Hawks of the Canadian Prairie provinces in their relation to Agriculture, Musuem Bulletin 28, Geological Survey, Ottawa, p. 6.

worms in gardens which have not shelter for his nest.

One may travel on the prairie for weeks without seeing a Robin, but the first tree planting of any size will almost certainly have a pair at least, and in addition to the good services of birds in controlling insects, it must be a barren life that does not enjoy their presence and their songs. These pleasures can be enjoyed in the cool, quiet shade of a planted woods on even the otherwise treeless prairie.

The bird lover will do more for his bird friends than merely provide them with the shade they need. Bird-houses will be appreciated by many of them and do not forget birds must have water. A shallow dish with a few pebbles for foothold will satisfy them for drinking and bathing. It should always be kept filled and be so placed that cats cannot reach it. In the limited area of a shelter belt about the house and garden a cat or two will succeed in destroying many adult and nesting birds. Cats and birds are not compatible, and one must decide upon which to encourage. A regular water supply is especially necessary on the prairies, and domestic cats can cause more damage in the limited area of a prairie shelter belt than elsewhere.

The persons who have taught the value of planting trees on the prairies have been concerned, and rightly so, in getting any suitable trees planted that would grow under the various climatic conditions of the Canadian West. Certain trees and shrubs are especially attractive to birds because of their fruit, and in case any bird-lover on the prairies wishes to plant some trees and shrubs, especially for the birds, he cannot do better than consult the list which is given below. Some otherwise valuable birds will molest cultivated fruits, but the damage they cause has usually been amply repaid and more by the insects destroyed.

One way to lessen damage to domestic fruits is to provide the birds with early wild fruits. The list given at the end of this article was compiled by the Biological Survey, Washington, D.C., under the title: "Plants That Attract Birds and Protect Fruit." The original list as published was carefully amended to meet Canadian conditions by the late James M. Macoun.

Plant trees on the prairie, for in addition to their obvious advantages there is pleasure and profit in attracting tree-loving birds to devour the insects in your garden and orchard.

To the oft-repeated question: "How fast will a planted shade tree grow?" there are many convincing replies. The above silhoutte photograph shows a mammoth maple planted in 1860 in the Seminary courtyard at Quebec by King Edward VII., then Prince of Wales

Plants to Draw Birds

The plants given below will grow in the western or arid division of the Transition zone, which comprises the southern Assiniboia (now southern Saskatchewan and Alberta) and small areas in southern Manitoba . . . the higher parts of the Great Basin and the plateau region generally (except the Boreal Mountains). . . . . . In this area the sharp-tailed Grouse . . . . is a characteristic bird. . . . Many other species occur, however, and those desiring to attract them will find the following shrubs and vines serviceable:

Juniper (*Juniperus scopulorum*), barberry (*Berberis thunbergii*), currant (*Ribes cereum*), service berry (*Amelanchier florida*), red raspberry (*Rhubus strigosus*), choke cherry (*Prunus demissa*), aromatic sumach (*Rhus trilobata*), silverberry (*Elaegnus argentea*), buffalo berry (*Shepherdia argentea*), red oiser (*Gornus stolonifera*), snowberry (*Symphoricarpus racemosus*), elder (*Sambucus glauca*), mountain ash (*Pyrus americana and P. Aucuparia*), and Siberian crab-apple (*Pyrus baccata*).

In addition to these plants any of the native fruit-bearing plants of the coulees may be transplanted to the place to which it is desired to attract birds.

Timber Industries' Council

Under the able direction of Mr. M. A. Grainger, former Chief Forester of British Columbia, the Timber Industries Council of British Columbia has been formed. This marks a definite step forward in co-operative organization for the advancement of the timber industry in all its branches. The Council will tie together not only the timber owners but the industrial operator. In its Directorate will be included representatives of the Lumbermen's, Loggers', Shingle Manufacturers' and Timberholders' Associations, as well as the pulp and paper companies. The Council is not a separate grouping of the individual operators and timber holders' associations.

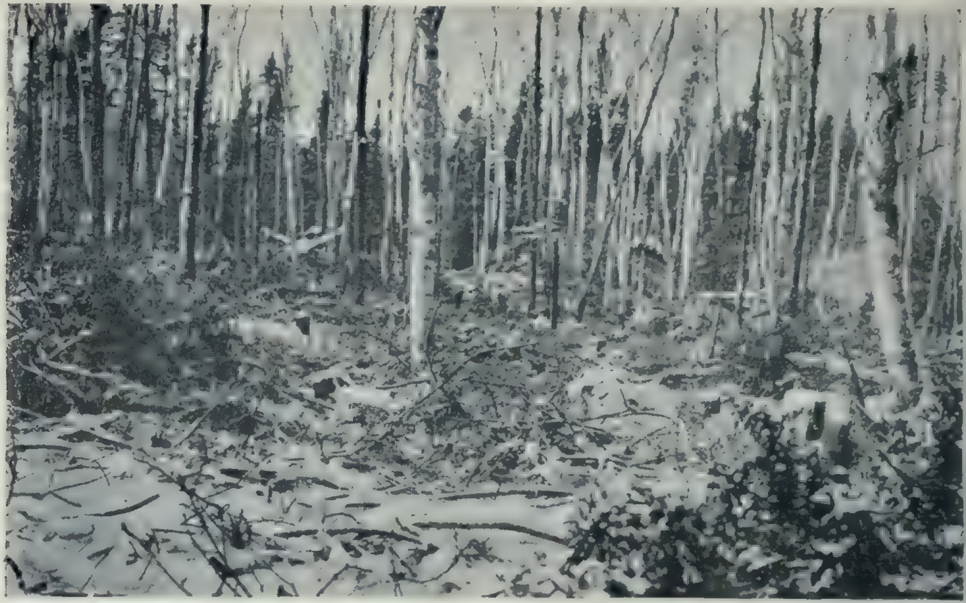
Many general matters affecting the industries which have been nobody's business and have thus run the risk of being neglected—unless one or two of the associations or a commiittee of individuals were willing to look after them—will now be referred to an office definitely responsible for getting results. The general question of how to secure more stable conditions throughout the timber industries and closer co-operation between the different sections into which they are divided will naturally be one upon which persistent get-together work will have to be done. Taxation, transportation, forest protection and legislative issues; united action when laws, regulations, government or banking policy impose hardships on timber owners or timber industries; the securing and circularizing of information useful to those concerned with timber; joint action in advertising forest products—these are among the many matters in which the Council will take an active part.

Canada's Forests Vital to the Empire

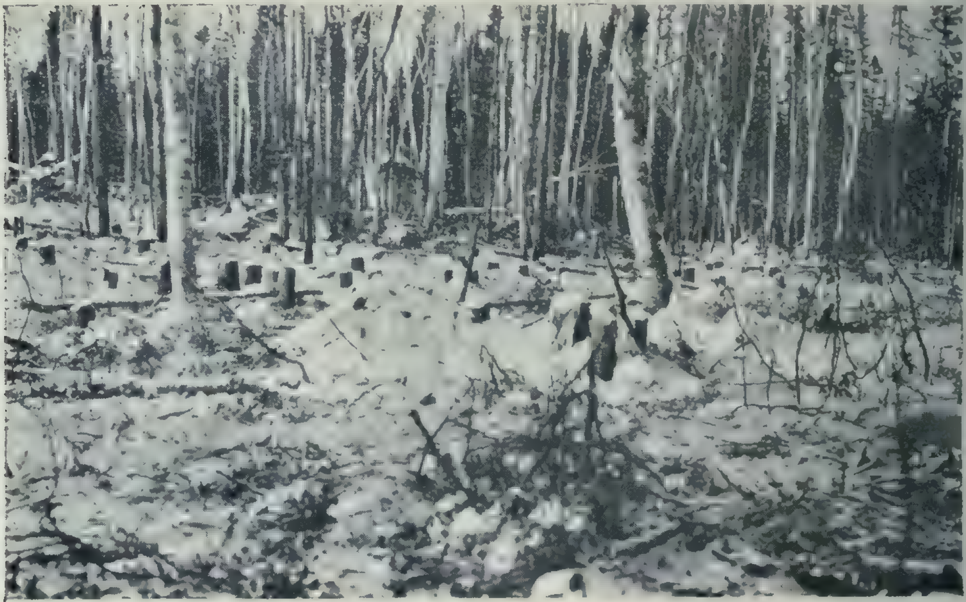
The position of Canada in the world as a forest country is a large and important one, and in the British Empire it is even more important. The authorities on forestry in the British Isles are laying stress on the unique position held by Canada in the British Empire for the supply of coniferous timber, and have been urging on the Imperial Government the necessity of providing fully for the proper protection and management of Canadian forests. The situation in Canada is complicated by the fact that the forests are divided in ownership among a number of governments which have independent jurisdiction, but it would seem that in response to the call from the Imperial Government some wider system of co-operation between the Federal and Provincial Governments might be worked out.—Annual Report, Director of Forestry, Ottawa.

The following slogan was awarded first prize out of a total of 1,150 submitted in the recent fire preventive slogan contest in Oregon:

"Lumber, fuel, beauty, joy,
Forests furnish, fires destroy."



Experiments in New Brunswick: The two photographs presented on this page illustrate an interesting experiment in the burning of the debris left by logging operations. The above picture shows the appearance of the woods with the slash snowed under before the burners arrived. Fires are in progress to the right and left. The depth of the slash may be judged by the fact that nearly all the stumps are covered over. The following picture was taken from nearly the same spot a few days later.



Experiments in New Brunswick: The burners have completed their work. The covering of snow made the operation perfectly safe and did not seriously interfere with the effectiveness of the burn. Note the number of stumps now visible as compared with the foregoing photograph. This area illustrates a severe cutting, 244 trees having been taken off, yielding 7,500 feet, board measure.

Forest Experiments in New Brunswick

By W. M. Robertson, Forester, Commission of Conservation

An Effort to Discover Better Methods of Securing Maximum Reproduction of Black Spruce

THERE is an increasing appreciation among timber-land owners that the old methods of forest exploitation do not as a rule leave the forest in a condition to produce another crop of timber of the more valuable species.

In connection with the Crown timber survey, the New Brunswick Forest Service has devoted considerable attention to studies of regeneration, volume and rate of growth of the principal timber species. As one phase of this research work, the Provincial Forest Service, in the summer of 1919, entered into a co-operative arrangement with the Bathurst Lumber Company, Limited, for the conduct of some experimental cuttings on the limits of the latter near Bathurst Mines, Gloucester county. In this project, the Commission of Conservation has also co-operated, the field work being carried on under general direction of Dr. C. D. Howe, with the writer as party chief. A tract of 500 acres has been set aside and is reserved for twenty-five years for experimental purposes.

The object of the work is to demonstrate what are the best and most practicable methods for the management of slow-growing black spruce, of which there are considerable areas in New Brunswick as well as in the other forest provinces of eastern Canada. The topography, soil and types found on the plot being characteristic of considerable areas, any deductions from these experiments may be of wide application.

The surface is flat or slightly rolling and the soil for the most part is shallow and sandy, with numerous loose boulders. The main stand of timber is even-aged, 80 to 90 years, having followed the great Miramichi fire of 1825. The forest types may be classed as mixed (conifer and hardwood) slopes, about 200 acres; conifer flats, 250 acres; spruce and cedar swamps, 35 acres; and the remainder of the area as waste (water and rock). The uplands, where the soil is somewhat deeper and the drainage better, bear a mixed type composed of white birch, red maple, poplar, black and white spruce, balsam fir and white pine, over 50 per cent. of which is coniferous. A good growth of cedar occupies the swamps. The stand on the conifer flats is composed of pure black spruce, very dense, and for the most part in the polewood or small timber stage.

A study of ring counts and measurements reveals comparatively good growth of the stand for the first four decades, with a very markedly decreasing rate during the remaining five decades. In order to determine why such a condition exists, and what remedy, if any, can be applied to maintain the increment, intensive study and experimentation are necessary.

Certain parts of the stand have been wind-thrown. A system of cutting to be recommended to reduce loss from this source can be found only by trial.

The principal objects of the experiments are to determine:—

(1) The best conditions for the natural regeneration of the commercial species after logging.

(2) The effect of various degrees of thinning upon the subsequent rate of growth of the remaining stand.

(3) The effect of thinnings upon wind-firmness.

(4) The comparative results from natural regeneration and artificial regeneration (planting).

With these objects in view, the New Brunswick Forest Service surveyed the plot, dividing it partially into strips, one, two or three chains wide, and partially into 1-acre circles, which are being managed under different methods.

The Bathurst Lumber Company logged some 300 acres of the plot during the winter of 1919-20. The remainder of the plot has already been cut this season

The reference map accompanying this article illustrates the method of subdivision. Each alternate strip was two chains wide. These, in rotation, were cut to 10-inch, 8-inch and 6-inch diameter limit. The slash was alternately lopped and left as it fell.

The other alternate strips were cut clear of conifers, and in pairs were one, two or three chains wide, *i.e.*, two strips were 1-chain wide, next two 2-chains wide, etc. The slash on the clear cut strips was alternately burned and left as it fell.

At the south end of the plot, eighteen 1-acre circles were cut clear. The slash half of the number was burned, on the others either lopped or left.

This arrangement of strips affords an opportunity for a comparative study of the progress of regeneration on areas thinned to 10-inch, 8-inch or 6-inch diameter; and with slash lopped or left; and on clear cut strips of several widths with slash burned or left as it fell. The varying width of the strips will also provide data as to the distance to which seeding from the side can be secured.

The question of wind-firmness may be studied relatively when the windbreak strips are variously thinned with clear-cut strips of different widths intervening.

During the past summer it was deemed advisable to alter the arrangement of the strips somewhat, and accordingly the remaining 200 acres of the plot were surveyed into strips 3 chains wide. The odd numbered strips, *i.e.* Nos. 1, 3, 5, etc., were clear-cut, the others, 2, 4, 6, etc., were cut to a 12-inch diameter limit. Over the entire season's cut, with the exception of some 25 acres on which the slash was piled for burning, the tops were lopped.

This change of regulations considerably increased the range of experimental possibilities. The 12-inch diameter limit is added, and the 3-chain wide windbreak strips do not appear in the original arrangement.

To "mark" the trees for cutting to the proper diameter limit, the regulation governing each strip was written at frequent intervals along the blazed strip line, and a pair of calipers was supplied to each gang.

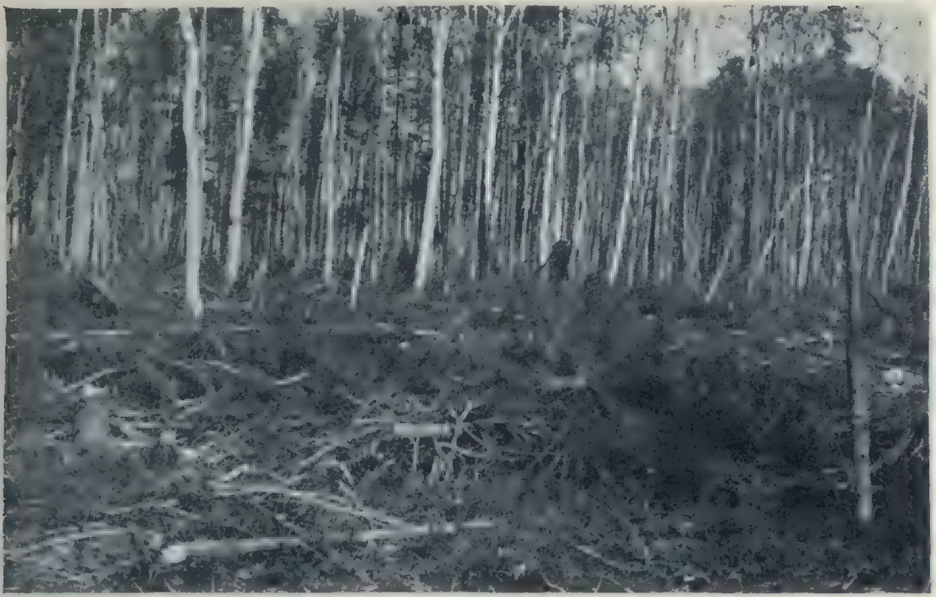
The principal object of disposing of slash by the various methods on this experimental tract is threefold, namely, to determine the relative values (1) in aiding reproduction, (2) in controlling insect hazard, and (3) in reducing fire hazard.

Behind each logging gang, a crew of two or three "brushers" followed as a separate unit rather than as a part of the gang.

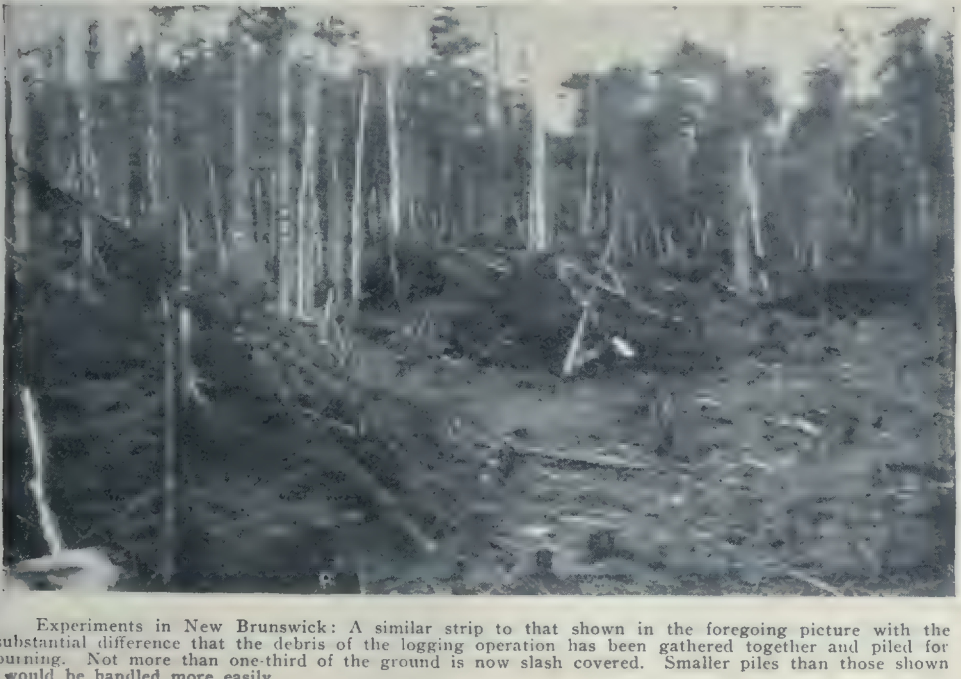
Piling the brush, if fairly dry, in numerous small piles before firing any, then burning a number of piles simultaneously was found to be the most satisfactory method. But when wet or snow-covered tops were to be disposed of, a coal bed from dry wood was first necessary. On such a bed the large percentage of water that can be disposed of with the slash is remarkable.

To compare rate of growth in the past with prospective rate of growth, complete measurements showing stump height, log lengths and top lengths, diameter at each section and at breast height, age counts at each section with the radial growth in 10-year periods, in other words, stem analyses, were taken of all conifers on one tenth-acre plot on each diameter limit strip. From sixteen of these plots, 670 trees and perhaps as many saplings were recorded.

The experiment will afford an opportunity to compare planted seedlings with those of natural regeneration. Therefore, 5,000 plants 3-years-old stock, of Norway spruce of fair viability were set out in May last. These were distributed



Experiments in New Brunswick: In the section shown in the foreground of this photograph a portion of the strip had been cut clear and slash left on the ground in November, 1919. The photograph was taken in October, 1920, and although the spills have fallen to the ground the fire hazard is by no means reduced 90 per cent. of the strips covered with slash.



Experiments in New Brunswick: A similar strip to that shown in the foregoing picture with the substantial difference that the debris of the logging operation has been gathered together and piled for burning. Not more than one-third of the ground is now slash covered. Smaller piles than those shown would be handled more easily.

over the experimental plot in nine plantation plots (see map), varying from one-tenth to one-half acre in extent, so located as to secure representative conditions of soil, ground cover and shade.

A recount of these plants, made in September, shows 71 per cent. living, 17 per cent. dead. The remaining 12 per cent. could not be found. Possibly some of these "missings" hidden beneath slash may survive and increase the percentage of survivals. Careful records of these plots have been made.

Four one acre permanent sample plots, one each on a strip cut to 6-inch, 8-inch, 10-inch and 12-inch diameter limit respectively, were surveyed and mapped; every tree and sapling thereon numbered and recorded as to species, diameter breast high and crown condition, and the location shown on the map.

The primary objects of establishing these plots are to determine the effect of the thinnings:—

(1) on the rate of growth of the remaining stand.

(2) on the wind-firmness of the remaining stand.

(3) on the rate of reproduction.

(4) on the death rate.

It is proposed that these plots be measured and measurements recorded and compared every fifth year hereafter until at least four records have been taken.

A strip survey was run in which all trees, free, suppressed, dead or wind-fallen since the cut, and all stumps on strips cut to 6-inch, 8-inch, 10-inch or 12-inch diameter limit, were calipered and recorded. In all, 44.2 acres, principally in the coniferous type, were included in this survey.

From the data thus obtained, and by the use of the volume table previously mentioned, it is intended to determine:—

(1) the volume of timber that stood on the various strips before the cutting;

(2) the volume removed at cutting;

(3) the percentage volume still standing and

(4) the percentage of wind-fall since the cutting.

At the time the strip survey was being run, an estimate was made of the ground covered by slash under the various degrees of culling. This will be of interest in connection with the study of the progress of the natural regeneration.

The white spruce seed crop of last fall was a bumper one, and it was planned to sow a few acres with this species in various manners and locations on the plot, comprehensive records of these seedings to be taken for future comparative studies. Frost and snow, however, intervened. The seeds are now on hand for the fulfilling of these plans at an early date next spring.

RECORD OF THE GROWTH OF A BALSAM POPLAR

THIS tree grew in a mixed bush of poplars, ash, soft maples, elms and the customary under wood in a swamp spot, in the lumber yards of McLachlin Bros., Ltd., Arnprior, Ontario. The entire grove covered about eight acres of ground. Several other poplars grew around the same spot as the one here referred to, reaching a diameter of from 20 to 25 inches two feet from the ground.

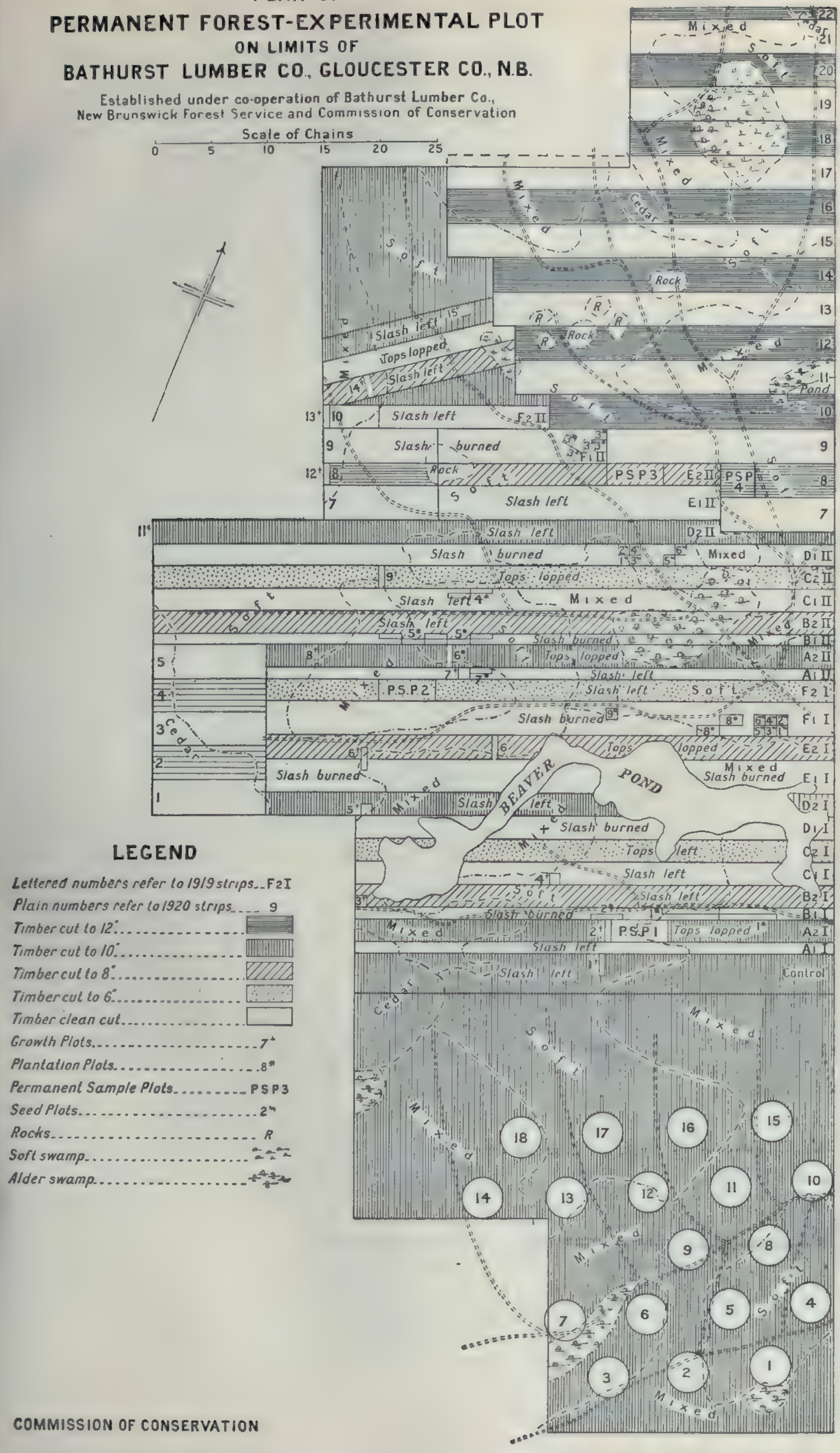
The land upon which these trees grew was cleared absolutely of all trees and underbrush of any kind under the supervision of the undersigned in the autumn of the year 1870. The tree was felled in December, 1920, and produced three saw logs, two of them 16 ft. long and the top log 12 ft. long, 14-inch diameter at top end. The wood in the tree was sound without sign of rot anywhere.

Growth.

1872-1877	3	inch	diameter
1877-1882	6¾	"	"
1882-1887	10	"	"
1887-1892	14¼	"	"
1892-1897	17¾	"	"
1897-1902	19¾	"	"
1902-1907	21¾	"	"
1907-1912	23¾	"	"
1912-1917	24¾	"	"
1917-1920	25½	"	"

ARMON BURWASH.

PLAN OF
PERMANENT FOREST-EXPERIMENTAL PLOT
ON LIMITS OF
BATHURST LUMBER CO., GLOUCESTER CO., N.B.
Established under co-operation of Bathurst Lumber Co.,
New Brunswick Forest Service and Commission of Conservation



COMMISSION OF CONSERVATION

The Year's Story of Our Association

Membership steadily advances with an enlarged programme of field work accomplished

AT the Annual Meeting held at Montreal on Thursday, January 20th, the Canadian Forestry Association celebrated its coming-of-age. The twenty-one years since the Association first saw the light at Ottawa have witnessed phenomenal changes in the development of forest industries and in the incorporation of forest fire prevention as a fundamental policy by the governments, the limit holders and industrial corporations.

In the year just closed, the Directors of the Canadian Forestry Association are gratified to report that the lines of work provisionally laid down by the Association's last annual meeting have been carried out and many new enterprises established. Revenues have been built up almost double those of 1919, membership has advanced by 3,000 and all the field enterprises in which the Association is engaged find themselves today on a secure footing.

It should again be made clear that the Forestry Association is not a passive institution with merely a set of objects and a hopeful attitude but is engaged in aggressive educational campaigns, itself supplying the men and machinery and being responsible for their direction and financial maintenance.

First and foremost we have sought to put the emphasis on forest fires as the supreme foe to forest duty of all responsible authorities. We have endeavored to stimulate better forest protection laws and improved administration. The public advantages of having all land classified in advance of settlement and, if non agricultural or of two meagre dimensions to support a strong community, to reserve it permanently for timber growing, has found in our Association an insistent advocate.

We have striven to impress upon the Canadian people the pre-eminent value of the forest industries as creators of employment and distributors of wealth. At the same time we have tried to demonstrate the identity of interest between the permanent existence of these industries and systematic forest management.

These are all objects of great economic consequence and none can be achieved except through an informed public. The carrying out of this duty of popular education is a vast work and the large share of it given to the Canadian Forestry Association is due probably to the recognition that our freedom of action as an independent national body is guarantor of public confidence and co-operation.

Methods of Working.

Our channels for reaching the public may be defined as follows:

The membership, which is now twelve thousand five hundred.

The newspaper publicity bureau which has retained a friendly contact with all newspapers.

The Speaker's Bureau of three hundred volunteer workers, generously spreading our propaganda to thousands of people, including school children.

Our Western Tree Planting Car.

Our Eastern Exhibition Car.

Our Travelling lecture sets of lantern slides, and lecture manuscripts.

Our Illustrated Forestry Magazine.

Such special methods as results from the use of warnings in cigarette packages, etc., also from the co-operation of railway companies in placing our "sermonettes" on menu cards.

A startling photograph of a raging forest fire taken at the Grand Rapids, Athabasca River, Alberta, by Mr. A. M. Narraway of the Topographical Survey Branch, Ottawa.

The Man in the Field.

One of the most active and effective agencies in the hands of the Association is the field worker who travels to outlying communities and by public meetings, aided by motion pictures, wins the interest of masses of people in forest protection. In 1920 the Association held 340 public meetings. We have had in our service permanently or temporarily, seven men, with four assistants. These men are Messrs. Black, Blyth, Mitchell, Cooch, Valin, Doucet and Blanchard.

As the financial income and volume of field work increased, it was found necessary to secure larger quarters and to add an Assistant Secretary, Mr. Gerald Blyth. This was done in the early summer.

Inasmuch as the ordinary educational methods of the Association have been described in previous annual reports, mention will here be made only in the briefest form of the operation of these agencies.

The best testimony to the reception given the Association's newspapers contribution is the fact that in no year have the Canadian dailies and weeklies contained so much editorial comment favoring forest conservation. The prairie province papers, in turn have been highly generous in their discussions of tree planting, for shelter belt purposes. This favoured treatment by the Canadian press was supplemented in generous manner when thirteen publications agreed to give insertions to the Association's advertisements of its aims and objects. This was tantamount to a gift of many hundreds of dollars to our work, and is herewith gratefully acknowledged.

On the Prairies.

Some special reference should be made to the inauguration of our Tree Planting Campaign in the Prairie Provinces. This was made possible by the private subscriptions of business firms who realized that the economic consequence of extensive shelter belt planting in helping to offset soil drifting, wind damage to crops, and as an improver of home surroundings, justified an educational campaign. For this task we secured Mr. Archibald Mitchell, a western tree planting expert with marked ability as a propagandist. From the beginning of June to the middle of October, Mr. Mitchell and his assistant, Mr. A. Cooch, worked industriously holding 170 public meetings and by direct and indirect methods stirring up a serious popular interest in the purpose and methods of tree planting on the prairies, such as could have been accomplished in no other way. By the courtesy of the President of the Canadian Pacific Railway Company, a railway coach was loaned to us, which we equipped as a motion picture auditorium, with special electric generator and machines, with special tree planting films. Mr. Mitchell, in the course of his work with audiences of adults and school children was able to assist many municipalities and public societies in establishing town parks and beautifying municipal surroundings. He provided complete working plans for many communities. We are under no delusion that miraculous results can spring from a single season's campaign. The enterprise, however, was highly appreciated by the Western people, and has done a pioneer work that will show substantial consequences in the near future.

It is the Association's present plan, with approval of the provinces directly concerned, not only to repeat in 1921 the work done on the prairies last year but to double the length of the working season.

East of Manitoba, our Eastern Exhibition Car, loaned us by courtesy of the President of the Canadian National Railways, was in service from June 1st to nearly the middle of December in charge of our own men for the greater part of the time. The Association herewith thanks the Government of Quebec for the services of Mr. Valin and Mr. Trottier who ably aided us for some weeks at the end of the season.

50,000 *Attendance.*

The object of the Forestry Exhibition Car was to interest the public in the products of the forest and to impress the necessity of forest protection. Meetings were held daily, with motion picture demonstrations, and short lectures. It is a conservative estimate to place the total attendance of visitors at the car during the 1920 season at 50,000 and the total number of people at the evening meetings held in connection with the car's visit at 20,000. The route of this car covered from Sault Ste. Marie, Ontario, to Saint John, New Brunswick. During the late Fall tour in Central Quebec, the public interest in the Car was truly remarkable. Our French lecturer was sometimes obliged to hold as many as five meetings daily to accommodate the requests of schools and the adult public.

It is well to explain here that the portion of our Association funds, properly applicable to the Exhibition Car, has made it necessary during the past two years to build up the exhibits from borrowed material, without much regard to a definite educational plan. We want to secure a larger and newer coach for this year and to equip it in such a manner that the visitor will carry away a distinct and permanent impression of the car's object.

In addition to the lectures associated with the travels of our railway coaches, we engaged Mr. J. A. Doucet, for two campaigns in the Temiskaming region working out from Ville Marie, Quebec, and the Lake St. John region where series of large and unquestionably influential public gatherings were held. Recent reports from the fire rangers of these districts refer eulogistically to the good results accomplished and ask for an extension of the work in the future. Mr. Doucet carried into the back settlements one of our electric generators and was able to present the first motion pictures seen by hundreds of people. That these pictures were fire prevention propaganda did not by any means weaken the service done to forest protection in those districts.

Developing the Journal.

In holding our members together and quickening their interest in forestry and kindred subjects, our official publication, the Illustrated Canadian Forestry Magazine, has rendered prime service. With sharply rising costs of publishing we faced the alternative of deteriorating the quality of the magazine, thereby forfeiting our likelihood of new members and possibly the allegiance of some of our old members, or building up the magazine to large size and taking the consequences, both favorable and adverse. We feel satisfied that the Association has gained greatly by keeping up the high standard of the magazine. It is now 60 pages as compared with 48 pages last year. Each issue contains numbers of original articles and attractive illustrations while the confidence of many national advertisers has been won and we look forward to overcoming the entire cost of publication by advertising revenue. At the close of 1920 our books contained advertising contracts amounting to $5,000 which in itself is ten times the advertising revenue of the magazine in 1919.

The membership of the Association increased in 1920 by three thousand, which, with allowance for resignations, deaths and the list of missing, gives us a healthy membership strength of 12,500 with which to commence 1921. By no means was the past year propitious for the growth of such a body as the Canadian Forestry Association. Business uncertainty and foreboding tempted prospective members to postpone action and only the improved quality of our Forestry Magazine was able to secure us headway. Corroboration of this general experience of public associations in membership's growth is supplied by the record of other associations in this country and the United States.

Financial Progress.

We come now to our concluding subject: The Association's experience in financing its programme. Outside of our membership fees, we have no source of money except what can be annually procured from friendly governments and private corporations. The record for 1920 shows a total of $38,418.94 as compared with $20,071.88 in 1919. The revenue for the year just closed represented an increase of 91 per cent.

Government grants for 1920 were $8,850 as compared with $4,600 in 1919, an increase of 92 per cent.

Special subscriptions were secured in 1920 to an amount of $15,290, as against $6,840 in the previous year, an increase of 123 per cent.

Membership fees advanced from $7,584.78 in 1919 to $12,973.75 in 1920, an increase of 71 per cent.

Advertising revenues of the Forestry Magazine advanced from $532.75 to $1,968 in 1920, an increase of 269 per cent.

We ended 1920 with a balance on hand of $1,990.27.

It may be appropriate here to recount the steady advance of Association income in recent years:

1915	$ 5,279.23
1916	7,182.60
1917	11,192.16
1918	14,290.10
1919	20,071.88
1920	38,418.94

One of the most satisfactory evidences of the gain made by the Association in the good opinion of the wood-using industries is afforded by comparing our 1920 grants from special sources, exclusive of governments, with those of previous years.

1916	$ 1,010.10
1917	2,235.00
1918	3,750.00
1919	6,840.00
1920	15,209.00

Plans Ahead.

Of the many plans for extending the scope of the Association's influence throughout Canada, one of the most important which has already been passed upon by the Directors of the Association is the establishing of a permanent French-speaking propagandist for the province of Quebec. This has been carried to the point of a formal application to the Minister of Lands and Forests of Quebec for an annual grant of $5,000 which would be entirely expended upon the work of this officer. We entertain strong hopes that our application will meet with the approval of the Quebec Government.

Similarly we have applied to the Government of Ontario for an increase in its annual grant from the previous total of $1,000 to $4,000 and a deputation has already waited upon the Prime Minister to urge our petition. A favorable response has been given us by the Government of Saskatchewan which appears willing to make a grant to maintain our tree planting campaign in Southern Saskatchewan. The decision of Alberta will not be available for about a month. Through the Association's friends in New Brunswick negotiations have been opened with the Provincial Government of that province for an increase of the Provincial grant from $350 to $1,500.

While the Directors feel a reasonable pride in the Association's achievements since its inception and particularly in the year just closed, we do not wish to err on the side of excessive optimism. Our field is continually extending and much careful planning and hard work lie ahead of us if we are to live up fully to our responsibilities.

Changes In Directorate of Canadian Forestry Association

AT the Annual Meeting of the Association in Montreal, January 20th, a new basis of representation of Directors according to provinces was adopted with the object of providing a better balance as between the eastern and western provinces. According to the Constitution of the Association the Directorate shall consist of forty-five elected members and the presidents of the Association since 1909-10, making a total of fifty-six. Mr. G. C. Piché of Quebec pointed out that a preponderance of eastern representatives on the Directorate was a natural outcome of the earlier identification of the Forestry Association's work with Eastern Canada. Mr. Piché held that the redistributing of Directors should not be proceded with at the present time but that in future elections vacancies should be filled by representatives of the Western provinces.

The meeting finally agreed upon the following basis of representation: Ontario15, Quebec 10, New Brunswick 3, Nova Scotia 2, British Columbia 6, Alberta 3, Saskatchewan 3, Manitoba 3.

A nominating committee of seven was chosen and after careful consideration brought in the following list of nominations for 1921: Patron, His Excellency the Governor-General; Honorary President, Rt. Hon. Arthur Meighen, P.C., M.P.; President, C. E. E. Ussher; Vice-President, Dan McLachlin.

Ontario Directors: Gordon C. Edwards, Clyde Leavitt, R. H. Campbell, Dr. B. E. Fernow, C. J. Booth, E. J. Zavitz, Albert Grigg, Percy B. Wilson, T. W. Dwight, J. A. Gillies, J. W. Black, W. E. Bigwood, C. T. Young, Dan. McLachlin, Hon. Geo. Gordon.

Quebec: Hon. Jules Allard, Alex. MacLaurin, Rev. Mgr. Roy, G. C. Piché, Sir William Price, Brig.-Gen. J. B. White, Geo. Chahoon, R. O. Sweezey, Avila Bedard, Elwood Wilson.

New Brunswick: David Champoux, Angus McLean, W. E. Golding.

Nova Scotia: F. J. D. Barnjum, Hon. N. Curry.

British Columbia: Hon. H. Bostock, Hon. A. C. Flumerfelt, R. D. Prettie, P. Z. Caverhill, Chas. D. McNab, H. R. MacMillan.

Alberta: Wm. Pearce, G. P. Marnoch, Norman Harvey.

Saskatchewan: Hon. W. F. A. Turgeon, John Dixon, Jos. Glenn.

Manitoba: John W. Dafoe, G. W. Allan, E. Fitzgerald.

The following past-presidents of the Association since 1909-10 are ex-officio directors, under the constitution: T. W. Southworth, Hon. W. C. Edwards, G. Y. Chown, Hon. W. A. Charlton, F. C. Whitman, Lt.-Col. J. B. Miller, Hon. Sydney Fisher, Col. J. S. Dennis, J. S. Gillies.

The Committee recomended that Mr. Wm. Little, one of the founders of the Association and a most devoted supporter of its work, should be retained as an ex-officio Director of the Association.

Mr. Ussher entered a strong demurrer to his re-election as President for a second term, owing to the urgency of his official duties. The members of the Nominating Committee, who were heartily backed by the general meeting, brought such pressure to bear upon the President that he finally consented to undertake the duties of the office for 1921. Mr. Ussher declared that he regarded his re-election as a distinct compliment and that his readiness to serve the Association was only tempered by the demands of his official position.

A resolution of condolence to the relatives of the late Mr. Wm. Power and Mr. A. S. Goodeve, who as Directors of the Canadian Forestry Association had given loyal service for many years, was moved by Mr. Cyril T. Young and seconded by Mr. Little.

The meeting gave some time to the discussion of a special subject placed upon the agenda by request: "Forest Fires Continguous to Steam Railways." Mr. Leavitt explained the jurisdiction of the Board of Railway Commissioners, which, he made clear, did not extend over the government-owned systems. Mr. Gregory gave a resume of his address of the previous afternoon to the Quebec Forest Protective Association concerning the neglect of precautionary measures in the prevention of forest fires by the Canadian National Railway lines. Mr. Ellwood Wilson moved, seconded by Mr. Graham, that a committee of the Canadian Forestry Association be appointed by the executive to co-operate with the committee selected by the Quebec Forest Protective Association in bringing before the C.N.R. authorities the question of establishing on C.N.R. lines the same forest protection regulations as now apply to the privately-owned railways.

There is only one way of making the Canadian Forestry Association a fighting power in forest protection: If your membership fee of $2 is unpaid for 1921, put your cheque in the post box to-day. The Association wages its campaigns entirely on voluntary subscriptions.

Methods of Distilling Wood

By Dr. Alfred E. Macintyre, Ottawa

(*Article No. 2*)

HARDWOOD, for distillation purposes, should be cut after the leaves fall, and should be permitted to dry in the sun and wind, during the spring and summer months. Under favorable conditions, the moisture content of the wood should then vary between 12 and 20 per cent. All portions of the tree can be utilized, from the trunk to the small branches. Everything above five inches in diameter should be split to admit of the easier penetration of the heat of decomposition and freer evolution of the gases. Hardwood mill slabs, edgings, etc., can be utilized and, as will be observed later, even hardwood chips and turnings are distilled. Decayed wood should be rejected, as the yields are poor and the charcoal produced from it, a source of danger, owing to its great liability to spontaneous ignition. Moisture in the wood is advantageous, but wet wood takes a longer time to carbonize, and the crude pyroligneous liquor obtained is more dilute, necessitating more evaporation, with corresponding greater consumption of fuel, although the yield of acetic acid and methyl alcohol is slightly higher in comparison.

Carbonizing Systems.

The systems employed for the distillation of wood are shortly as follows:—

1. The plants erected upon the retort system and each unit holding from one to three tons of wood.
2. Mechanical plants which deal with chips, shavings and other small wood.
3. Kiln plants, of beehive type, holding from 100 to 150 tons of wood.
4. Oven, or large retort plant, in which the wood is piled upon small trucks and run into the oven upon rails. The charge averaging about 16 tons, but the capacity can be increased or decreased at will.

(a) The retorts were the early form of apparatus in use, and were formerly cylinders made of heavy cast iron of 3 to 4 feet in diameter and 8 to 9 feet in length, having a door for charging and discharging at the front and an outlet, at the other end, connected to a condenser, for conducting off the gases evolved during the carbonization process. The door sometimes constituted the whole front end, and in other instances was only an oval opening in the front, about twenty inches across, and reaching nearly from top to bottom of the cylindrical retort. The doors were luted and fastened by wedges. These retorts were loaded and drawn by hand. They were protected from the direct action of the flame, from the furnace, by a system of firebrick arches and flues. Two retorts constituted a bench and one furnace supplied the necessary heat. These cast iron retorts were superceded by cylinders made of heavy steel plates, having cast iron fronts and doors. The retorts were arranged in such a manner that, when they were burned by the action of the flame, they could be revolved and another surface exposed.

(b) The mechanical retorts are continuous in their operation and are, as a rule, horizontal. The writer saw a mechanical retort in operation at the Camlachie works of Messrs. Turnbull, Glasgow, which was carbonizing birch turnings from New Brunswick spool wood. This was a cylinder with an endless screw conveyor, and screw hopper into which the turnings were fed and conveyed by the hopper screw to the top of the worm screw of the retort and carried through the latter. The charcoal was discharged, at the back end, into an air tight box. The gases given off in the process were passed to a condenser. The retort was heated from a furnace. A similar retort was at one time, employed for obtaining acetic acid and methyl alcohol from exhausted tan-bark of tanneries.

The vertical mechanical retort consists of a metal cylinder having spaced horizontal plates, with slots in the latter. In the centre of the retort, there is a shaft with arms attached, and the slots in the plates extend from the shaft to the circumference. The bottom of the retort is cone-shaped and fitted with an air tight box for the charcoal. When in operation, the wood is fed in at the top and is caught by the revolving arms of the rotating shaft and is carried over the hot horizontal plate until a slot is reached, the chips drop to the next plate and again are carried over the surface of the plate until it drops to the top of another, and this continues until the wood has been converted into charcoal and falls into the box. The gases pass upward through a passage surrounding the central shaft to a condenser. The control of the temperature, within a mechanical retort, is difficult and the yields of acetic acid and methyl alcohol much lower than in systems Nos. 1 and 4.

(c) The fire-brick beehive Kiln was introduced principally for the production of large quantities of charcoal for iron smelting. It proved uneconomical, inefficient in the production of condensable products, and offered difficulties in the control of its operation. In America, these installations were located chiefly in Michigan.

(d) From the retort system of steel, described under (a), there was developed the large steel oven having a much greater capacity, and into which the wood is conveyed loaded on small cars. These retorts were, formerly, rectangular steel ovens resting upon brick supports, with rollers to permit of expansion. The general practice, at present, is to suspend, by means of hangers, large rectangular retorts, 40-50 feet long, 8-9 feet wide, and 8 feet high, over furnaces. The expansion is taken care of by the free movement of the hangers. The bottom of the retort is protected, from the direct action of the fire, by firebrick arches and flues and the hot furnace gases circulate round the retort in such a manner that their heat is utilized to the fullest degree. The front, through which the laden cars enter, is closed by doors, and similar doors exist at the rear for the removal of the cars, when the carbonization is complete.

Cooling Charcoal.

The hot charcoal, from the cylindrical retorts (a), is drawn out by means of rakes and is placed in air tight coolers for 60-112 hours. In the case of the oven system, the air tight coolers are usually placed in double couples in the open, and are constructed of steel plates in the form of a tunnel. The first pair take the charcoal charge direct from the retort and holds it for twenty-four hours. It then passes to the second pair where the charge remains another twenty-four hours, and finally is exposed in the air for from forty-eight to sixty hours. This is necessary to ensure freedom from spontaneous ignition before the charcoal is loaded on cars or disposed of to the general public. Notwithstanding these precautionary measures, many cars of charcoal ignite during transportation and are destroyed.

Furnaces and Condensers.

The heating of retorts has been a subject of much technical investigation. The furnaces are generally designed to attain three purposes, protection of the metal of the retort, economical application of the heat, evolved in the furnace, to the distillation process, and further the utilization of the waste gases of combustion for evaporation and drying. The metal of the retort should be protected from the fire by fire-brick arches and flues. The hot furnace gases circulate round the retort in such a manner that they impart the heat efficiently to it. The exit combustion gases, on leaving the retort chamber, frequently, have a temperature of about 750 degrees F. and therefore contain much valuable heat capable of utilization.

The original type of condenser, used to condense the gaseous products given off in the distillation process, was a series of large copper or cast iron pipes of diminishing diameter, placed in tanks filled with water. This water was continually renewed by the introduction of cold water at the bottom, the warm flowing off at the top. The size of the condenser was such, that all the condensable gases, (which enter at a temperature of

660-700 degrees F.) were converted into acid liquor and should leave the condenser at 60-65 degrees F.

The modern type, introduced with larger retorts, is much more compact and consists of a tubular surface condenser, enclosed in a steel shell, cooled by the circulation of water. The efficiency of this condenser will be considered when the actual process of the distillation of the wood and the yield of prime products is discussed. With the oven system there are generally two such condensers, one at each side of the oven.

The uncondensable gases, from the condenser, are sometimes scrubbed to remove any acetic acid and methyl alcohol which they may contain. The gases in the majority of works, pass direct for utilization as fuel, sometimes under the retorts, in other cases for raising steam. The future contributions will deal with the distillation of the wood, products evolved, quantities obtained in general practice, and the possibility of increasing the yields by improved methods and through a more scientific control.

Tree Windbreaks on the C.P.R.

IN response to a request for information in regard to the prices of tree windbreaks on the C.P.R. Western Lines, we are advised that the last two summers were exceedingly trying on trees on the prairie, particularly from Moose Jaw west, where the greater part of the company's windbreaks were planted. The hot winds, that swept the prairie during the dry spell, played havoc even with stock that had been well established and had survived many hard winters. In some cases entire plantations were killed back, and what trees survived were severely checked in their growth. and had to be cut back in order to give them a fresh start. Another feature in the destruction of trees is the panel and slab fence, which has to be maintained until the trees are sufficiently thick to hold the snow. This causes the snow to pile up, and in some cases to completely cover the trees, with the result that the young stock are badly shaken up, when the snow thaws, and settles in heavy masses in the spring.

Of course tree windbreaks are most necessary on knolls and hills, where the track is in a cut. Trees so situated get less than the average amount of moisture, due to quick run off. For this reason trees along the right of way are at a greater disadvantage than they would be around a farm or on low lying ground.

It is generally conceded by all who have tried tree planting on the prairie, that the windbreak must be of at least eight rows of trees, and that it must carry a percentage of dense shade giving, or close foliage, trees. The object of this is to reduce the amount of evaporation and conserve needed moisture. It also reduces evaporation from the leaves in the hot dry spells.

When the C.P.R. started this tree planting there had been no experiments carried on west of Moose Jaw. by either government or private- individuals, consequently the company adopted the accepted planting practice of eastern Saskatchewan and Manitoba, and did not plant trees in sufficiently thick strips for territory farther west. When windbreaks have been planted east of Moose Jaw they have been decidedly satisfactory.

Prairie farmers are beginning to realize how beneficial windbreaks are around their dwellings, and more so around the farms, where by repeated cultivation and ploughing, the soil is puverized, and drifts from the heavy winds. This phase of tree windbreaks is receiving attention from the various farmers' organizations, which are advoçating it very strongly in their meetings and through their press.

The Forests of South America

Buenos Aires, 1921.

Difficulties in the way of lumber importation during the war has caused the South American republics to turn their attention to their own forests and to-day there is a movement for the conservation of timber lands, for a properly supervised cutting of forests, and a government regulated replanting of trees to replace those cut. The forests of South America constitute the most extensive and the most valuable source of lumber that exists anywhere in the world and if they were protected and worked under regulation, instead of being destroyed as they now are, they could be made the fountain head of untold wealth in the years to come.

Timber probably is the only natural resource in South America the development of which is not dependent on the construction of roads and railways, for there are navigable rivers in all the wooded lands that would permit the carrying of logs to consuming centers.

Recent forestry investigations in Argentina, Paraguay, Brazil and Colombia have shown the fallacy of the widespread belief that the tropical forests of South America contain only hardwoods. These forests contain soft and semi-hard woods which have proven fully as adequate for construction purposes as the pine which is now being imported from the United States.

Forests of West Africa

Among the woods are Okume, Spanish or French, according to its origin in Spanish Guinea or French Gabon, is used for cigar boxes and commonly known as cigar wood; also for veneers and as a substitute for mahogany.

Mahogany, of two species, the aromatic and the capeli, is found over the entire coast country.

Pear, Moabi and Njabi are found principally in Kamerun and Gabon. These are excellent furniture woods.

Others are: African nut, ebony, padona, lemon, zebra, African poplar, apzelia and poplar. These latter appear principally in Kamerun and are useful for various technical purposes and in the manufacture of furniture.

Annual Meeting of Forest Engineers

THE Annual Meeting of the Canadian Society of Forest Engineers was held in the Windsor Hotel, Montreal, on Jan. 18. There was a large attendance of members, and there were also several prominent foresters from the United States present. The meeting included morning and afternoon sessions, at which a number of interesting and instructive papers were delivered and discussed.

The prospects in forestry as a profession were discussed by Mr. Ellwood Wilson, Laurentide Co., in a paper entitled: "Mutual Help and Salaries" and Prof. W. N. Millar, Toronto University, led the discussion.

"The Relation of Foresters to the Logging Departments" was the subject of an able paper by Mr. B. F. Avery, Spanish River Pulp and Paper Mills, and Mr. G. H. Schanche, Abitibi Power and Paper Co., led the discussion.

Mr. E. F. McCarthy, of the Commission of Conservation, read a paper on "What answer can we give when we are asked to tell how timber in Eastern Canada should be cut by pulp and paper companies," which was based on studies made on cut-over lands. This paper aroused considerable interest, and was discussed by Messrs. G. H. Prince, New Brunswick, W. N. Millar and others.

Mr. Ellwood Wilson, assisted by Mr. C. R. Townsend, gave an instructive talk on the Interpretation of Aerial Photographs, illustrated with photos and lantern sildes.

Mr. D. C. A. Galarneau, St. Maurice Paper Co., described his method of conducting forest surveys, which brought out a number of interesting points which were discussed by Messrs. McCarthy, Schanche and others.

Mr. Roland D. Craig, Commission of Conservation, discussed the question of forest engineers joining the other branches of engineering in their efforts to secure legislation in Ontario protecting the engineering profession.

The following officers were elected for the ensuing three years:

President—M. A. Grainger, Manager, Timber Industries' Council of British Columbia, Vancouver.

Vice-President, Dr. C. D. Howe, Dean of the Faculty of Forestry, Toronto University.

Secretary—Roland D. Craig, Commission of Conservation, Ottawa.

Treasurer—T. W. Dwight, Forestry Branch, Ottawa.

An important amendment to the constitution was made permitting the establishment of a non-resident class of membership.

Resolutions were passed advising that the duties on seeds and nursery stock for forest planting be removed, and that all the government railways should be placed under the jurisdiction of the Board of Railway Commissioners, at least as far as fire protection is concerned.

NEW ZEALAND PLANS TO RENEW HER FORESTS

An issue of the New Zealand paper called "The Dominion" contains the following interesting article:

"Last session it was announced that it was intended to place the State forests under the control of a separate Minister, and in November last this intention was given effect to by the appointment of the Hon. the Attorney-General as Commissioner of State Forests.

"An area of about 1,800,000 acres has since been proclaimed State forests under that authority. Additional areas will be proclaimed as soon as the necessary maps are completed. It must be understood that the setting aside of provisional State forests is not a final reservation. As soon as the necessary arrangements can be made, the reserves will be inspected, and such lands as are found to be more suitable for settlement than for retention under forest will be made available for settlement. The total area of State forests and provisional State forests is now about 3.273.000 acres, but of this area a large proportion does not bear timber of milling value, and a proportion is treeless mountain land. Taking a mean between the proportion of the forest areas of France and Germany, this Dominion should have an area of 13,300,000 acres under forest to satisfy present and future demands.

"In the plantations a total new area of 2,800 acres was afforested, about one-third of the area having been planted by discharged soldiers. Arrangements are being made to employ a large number of soldiers, but difficulty is experienced in providing both accommodation and trained supervisors.

"The Commissioner of State Forests has publicly announced that the forests of New Zealand must be henceforth utilized for the people of New Zealand, and that consequently the export of all classes of timber must be limited at present and cease wholly in the near future, and further, that on land not suited for settlement, only timber ripe for milling must be cut, and the growing timber conserved on all lands continuing as State forests. Against the policy so declared there has been considerable protest from certain districts where it is contended that the export trade already established should continue and be allowed to increase in volume.

Courtesy American Forestry Association.

The most perplexing of all forest fires is one that starts in an old cutting where debris is heavily piled. Our photograph shows such a fire, against which even the best organized fire protection service is sometimes helpless to make headway.

B. C. Forests Develop Drug Industry

A WARNING that Japanese cutters are despoiling the forests of British Columbia by destroying, root and branch, all the native supplies of the cascara sagrada bush, is given by botanists and timber cruisers interested in preserving this valuable medicinal bark. The Legislature is to be asked at the coming session to pass legislation to preserve this and other valuable medicinal barks and herbs from destruction.

It is known that five tons of this valuable drug were shipped out of the Salmon Arm district recently by two Japanese gatherers, while two other of their compatriots shipped out a ton and a half from near Squamish. Another little company of Japanese gatherers took out three tons of cascara bark and roots from the Jervis Inlet district, and two tons were shipped by Japanese from Nanaimo from a new discovery of cascara on Vancouver Island.

The cascara which is referred to in the botanical works of ten years ago as "the Pacific Coast's great gift to mankind," is said now to be so depleted in Oregon and Washington as the result of reckless gathering that there is no longer any of this bark to be found within reach of transportation. Prices have risen within the last few years from 2 cents a pound to over ten cents a pound for the bark, and with the world shortage it is likely to become even more valuable.

At present Japan and Germany are the two great sources of supply for cascara bark, according to a medical botanist who is interested in the subject. In both of these countries the shrub has been introduced by seedlings from the Pacific Coast. Stringent laws are enforced to prevent greedy collection of the bark, the gatherers from the private orchards being forbidden to take from the trees each year more than it will be possible for the tree to reproduce. To take more than one-fourth of the bark surface from the tree is said to cause the death of the shrub, just as a human being would die from shock if more than a certain amount of the skin surface was removed.

Recently a British Columbia Company was formed to collect and export pharmaceutical herbs and barks and most of its employes are returned men who are being introduced in industrial botany. They are to be encouraged to take up pre-emptions, and will be taught how to cultivate and treat the various forest products. Where there are no existing specimens of needed botanicals on their pre-emptions they will be encouraged to plant them. Under the system they are being trained in, these botanicals will grow larger and heavier in yield from year to year. From the cottonwood trees they get the Balm of Gilead bud, which contains a very fragrant resin, bringing quite a high price per pound. From the jack pine they get a pharmaceutical gum. From the little spruce of 2 inches and 3 inches in diameter they get spruce gum. Five or six barks used in medicine are collected. Altogether, it is figured, a man with 40 acres or so in these wild botanicals, is just about as well off as a man with 40 acres of richly cultivated bottom lands growing fruit and farm produce.

The great market for these barks and herbs is shown by the trade reports. Last week one shipment of cascara bark was received at New York from Hamburg, weighing 30 tons, all of it grown from seedlings from the Pacific Coast. No climate in the world is said to be so good as the moist slopes of the Coast Range in B. C. Experiments tried with the seedlings from shrubs brought from California show that these will grow into quite large trees when planted there. Nature, at any rate, is fighting on the side of British Columbia so far as the cascara bark industry is concerned.

Serving the Settler on the Prairie

The Lecture Car of the Canadian Forestry Association, which was used to excellent effect through the three Prairie Provinces during the summer and fall of 1920 and for a short time in Central Quebec during November and December. This year the Forestry Association plans to reconstruct the interior of the Car so as to provide a sloping floor after the manner of moving picture theatres. The seating capacity will also be much increased and a powerful motion picture projector will be installed at the rear, the Car carrying its own special electric generator. New motion pictures have been arranged for, and with the great publicity given this enterprise last year there should be no doubt as to a hearty reception in hundreds of communities during the 1921 tour. For the greater part of the Spring and Summer this Lecture Car will devote its attention to the Prairie Provinces and will confine its educational work to the single subject of tree planting for shelter belt purposes. It is now widely recognized throughout the Prairie Provinces that the gross damage resulting from soil drifting and wind damage to grain crops can be well remedied by wind-breaks of trees.

Actual Results in Planting.

Mr. Norman Ross, Chief of the Tree Planting Division, Dominion Forestry Branch, at Indian Head, Sask., in speaking of the effectiveness of trees as windbreaks on field crops, at the conference on soil fibre and soil fertility at Winnipeg, under the auspices of the Commission of Conservation, gave illustrations of the results actually obtained. Of special importance was that secured at the new nursery near Saskatoon, which Mr. Ross described, where the main outside shelter belts had not yet reached more than six to eight feet in height. The nursery is divided into one-acre plots, each about 25 yards wide, with caragana hedges about 2 1-2 feet high dividing the plots. Of these plots 35 were sown to oats, after summer-fallow. Almost adjoining and on exactly the same class of soil and similarly cultivated, a ten-acre field was sown, also fifteen acres on stubble either spring or fall plowed. The ten-acre summer-fallow field was completely blown out, while the stubble field yielded but 10 bushels per acre. The protected summer-fallow plots yielded 40 bushels of oats per acre—the largest crop in the district. In other words, hedges 2 1-2 feet high and 75 feet apart, made all the difference between a crop of 40 bushels per acre and a complete failure, all other conditions being equal.

This question is of maximum importance to the Prairie Provinces, and some co-operative system of planting should be developed, whereby large areas could be set out, otherwise much damage may be done to protected lands by blowing soil from adjoining properties.

Lumbermen Choose Officers.

Mr. Dan McLachlin, Arnprior, was again elected President of the Canadian Lumbermen's Association for 1921; A. E. Clark, Toronto, is Vice-President; Angus McLean, Bathurst, N.B., Second Vice-President, while R. G. Cameron, Ottawa, is again Honorary Treasurer, and Frank Hawkins, Secretary. Next year's convention will be held in Toronto.

Forest Fires in B.C.

According to the "Pacific Coast Lumberman" the 1920 forest fire loss in British Columbia was the heaviest in many years, and not since the disastrous year of 1914 had so much damage been done. There were between thirteen and fourteen hundred separate fires recorded in the province, many of them burning over an extensive area. Although a comparatively small amount of merchantable timber was destroyed, amounting altogether to about 120,000,000 feet, as against 300,000,000 feet the previous year, the cost of fighting the outbreaks and the losses suffered in other ways reached a new high mark this year, being approximately $550,000, this including the cost of maintaining patrols and other details of protection service.

Ontario's Reforestation.

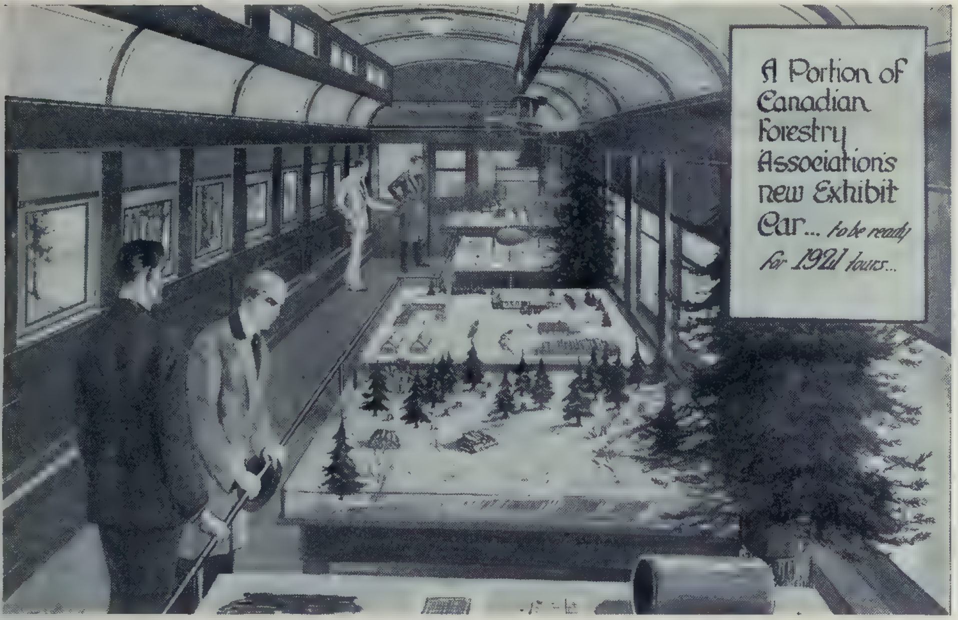
The Ontario Government should go in for a vigorous reforestation policy, advises The Farmers' Sun. The tremendous demands being made on our timber resources of the North, both for building materials and for the manufacture of pulp and paper, means that within a very few years this province will have to import its timber unless something is done to replace the trees now being cut down.

Money in Old Bridges.

The appreciation in value of timber is shown in a recent transaction in second-hand material. Last year, at Bellevue, Ont., a wooden bridge on the Algoma Central railway was removed and replaced by a steel structure. The bridge had been built about twelve years ago, of Douglas fir. After being taken down and after twelve years use, the timber, 1,250,000 board feet, was sold for a higher price than that originally paid for it.

Newsprint, another product of the forest, that before the war sold at $38 to $40 per ton, is now selling at $120.

If these products are worth so much more today than a few years ago, what must the increased value represent in the need of precautions for the adequate protection of our forests and for proper methods of cutting?—Clyde Leavitt.


A Portion of Canadian Forestry Association's new Exhibit Car... to be ready for 1921 tours...

A sketch of the new Forestry Exhibition Car of the Canadian Forestry Association which will be sent on a long tour commencing April third. The 1921 Car will be of a larger and better model than previously used, and will be laid out in such a way as to convey a definite object lesson to all who visit it. During the summer season of 1920 more than fifty thousand people paid visits to our Exhibition Car and an additional twenty thousand were present at the evening motion picture lectures conducted in conjunction with the Car's visit either in the open air or at a local hall. The Exhibition Car has been made possible by the courtesy of the Canadian National and Canadian Pacific Railway companies.

Palestine, a Forestless Land

By Rev. J. A. Macfarlane, M.A.

A Vivid Picture of the Economic Penalty Paid by the Holy Land Farmer of To-day

PALESTINE is the only land on the face of the earth where you can pass from Artic to Torrid conditions in the course of a journey of fifty miles. This is due not only to the heights of her mountains (for other lands have higher mountains), but to the fact that makes her unique amongst all the other parts of the world, the fact that she has land 1,000 feet lower than sea level. Elsewhere in the world places can be found where the land is 300 feet lower than sea level. In Palestine parts of the Jordan valley are almost 1,300 feet lower than sea level. Someone has said that probably no snow flake has ever succeeded in kissing the soil of the Jordan valley near Jericho. Upon the triple heights of Mt. Hermon, the snow lies almost all the year round, as she stands like a sentinel keeping guard over the Holy Land. Fifty miles away, down in the Jordan valley, you have reached the region of perpetual summer, and suffer from the sticky stifling heat.

Variety of Tree Life.

These conditions, ranging from Arctic to Torrid temperatures, enable Palestine to exhibit within her tiny boundaries samples of tree life that in most lands range from polar to equatorial regions. While oaks, ash, and terebinths; hackberries, carobs, and Pride of India, are found all over the land, certain kinds ot trees are grouped in particular districts. From the mountains of Lebanon along the ranges of hills to the northeast (beyond Palestine proper) are still to be found excellent forests of beech, pine, oak, cedar of Lebanon, hornbeam, cypress, spruce and yew. In the valleys near the Dead sea acacias are numerous; on the low lands near the Mediterranean coast, tamarisks abound; plane trees, poplars and willows cover the valleys of the land; northward in Palestine some remnants of the beautiful old forests are also to be found, the oak, pine, spruce, cypress and juniper, with some of the majestic cedars of Lebanon, and scrub oak on Hermon.

Ancient Palestine Forests.

It would take a whole article to describe the Bible references to the woods and forests of Palestine. We must here but say that if one starts from the noble heights of Hermon on the north and journeys southward through Palestine to Hebron, one finds that in the Bible there are plentiful evidences of the splendid forests that covered all the highlands of the country; and the central part of Palestine is one continuous highland, ranging from 1,500 to almost 3,000 feet above sea-level. The wonderful variety of ancient forests in Palestine may be surmised from the mere fact that five different Hebrew words are used in the Old Testament to describe wooded country. Some of the forests mentioned are those of the giant Cedars of Lebanon in the north; those that clothed Galilee and Samaria; the Woods of Ephriam; the Forest of Hareth on the western slope of the Judean hills; the Forest in the highlands of Judah, where King Jotham built castles and towers; the Forests of the South; and many others with their interesting Bible references. From these it is evident that ancient Palestine had these rugged heights of hers, today so desolate and bare and barren, well covered with woods and forests. The woods and forests held the moisture by their shade; their roots prevented the rains from washing the soil bare; and annually her falling leaves gave humus and fertility to a soil now pitifully barren. Even the insect and animal and bird life that congregate in wooded areas help to fertilize the soil. So that when rains washed soil from the wooded heights, they carried down fertility, not barren soil, to the lands cultivated below.

Forests in High Esteem.

There was nothing that the ancient residents of Palestine feared worse than to have their forests destroyed.

The threat to "Kindle a fire in the forest" was one of the sore punishments of wicked Judah (Jer. 21:14).

Sennacherib the Assyrian king was boasting of a fearful blow to Palestine when he declared, "I am come up to the height of the mountains, to the sides of Lebanon, and will cut down the tall cedars thereof, and the choice fir trees thereof; and I will enter into . . . . the forests of his Carmel," (2 Kings 19:23).

To cut the forests that clothed their heights was always a terror to the ancient Palestinians. And when the nation was filled with joy, the woods and trees and forests were supposed to reflect and echo that happiness: "Sing, O ye heavens, for the Lord hath done it; . . . break forth into singing, ye mountains, O forest, and every tree therein: for the Lord hath redeemed Jacob," (Is. 44:23).

"Let the heavens be glad, and let the earth rejoice; . . . Then shall the trees of the field sing out at the presence of the Lord," (1 Chron. 16:31-33).

Trees, woods, forests, were regarded as essential to the welfare and blessing of the nation.

Terracing Her Hills.

So important was it regarded in Palestine to preserve the soil from washing on the face of her immense hill slopes, that most of the ancient hills were beautifully terraced, and planted to fruit trees, The eastern and southern slopes of the hill of Bethlehem would be a bare desolation, but for the terraces. The whole slopes of this historic hill are terraced and planted with orchards of fig and pomegranite trees; while in the rocky land just eastward, where the plow cannot run her furrows, the whole region was once a forest of Olive trees, a veritable grove of Paradise, where otherwise barrenness would have reigned on a throne of stony desolation.

The Pitiful Contrast.

It is a favorite pastime for cynical travellers in Palestine today, to scoff at the Bible descriptions of Palestine as a "Land flowing with milk and honey." As one stands on any height, and looks about, one sees the neighboring heights, and of course not much of the valleys. Palestine robbed of the regal forest robes that once clothed her uplands with glory and beauty, and enabled her to pour generous hand humus and fertility upon the lower levels, stands today a queen without a crown, a land with mountain heights denuded of their forests; and consequently a land perishing and dying for lack of the moisture and shade and humus which for centuries her tree-crowned heights had supplied.

When Palestine had her forests on her hills, she was a land of wealth and beauty and fertility. Robbed of her forests, everything except her valleys is a desolation. Once her hills contributed an annual gift of fertility to her valleys; now anything that washes from her hills is poverty striken soil, lessening the worth of the soil below.

No longer may a Prophet sing in rapt measures of "The glory of Lebanon" and "The excellency of Carmel." The forests clothed them with glory; the trees with excellency; but their glory faded, and their excellency fled, when the trees and woods and forests were swept from their cloud-mantled heights.

The Menace of Insects.

Portland, Ore.—Of the 10,700,000,000 feet of yellow pine in private ownership in Klamath and Lake counties, Oregon, fully 8 per cent. has been killed during the last five or six years, or is now infested by beetles, says the forest entomologist of the Oregon experiment station. The average annual loss has been about 150,000,000 board feet, worth at least $250,000, or 300 times as much as the average annual fire loss in the two counties.

A careful comparison in other counties in Oregon, described by the entomologist, estimates the loss from insects in one year in a single county as more than double the five-year loss by fire in four counties.

The principal enemy in the Western pine forests is the Western pine dark brown beetle, which bores through the bark of the tree and excavates long, winding galleries in the soft formative tissue next to the bark. The effect of these hundreds of insect galleries is to girdle the tree, thus cutting off its supply of food and water, and causing death.

When the beetles become abundant and kill large numbers of trees, the infestation is known as an epidemic. These epidemic infestations usually run in cycles of from four to six years. The amount of timber killed on a given area while the insects are passing through this cycle may be as low as 6 per cent. or as high as 80 per cent.

The task of eradicating the insect pests has proved to be too big for private owners.

Ontario's Possible Profits.

Speaking at Kingston, Ontario, Premier Drury of Ontario expressed the belief that the timber wealth of Ontario would eventually become sufficient to meet all Government expenses. The new world stood in great danger of a timber famine, and the co-operation of all the people was sought.

Stop the Tree Butcher!

The Ontario Department of Highways has made a first class move in determining to stop tree butchery along public roads. Not only is it the intention to beautify the highways, but to preserve the existing beauty in that trees will not be mutilated or sacrificed wherever it is possible to save them. No company, telephone, power or telegraph, will be allowed to cut the trees without permission and only permission to remove branches which are entirely essential to transmission will be given, and in any case, only the minimum amount of tree pruning will be allowed and such must be done under the supervision of the department of public highways. In this connection various companies have entered heartily into cooperation with the department in that at present they are trying to clear their lines with as little mutilation of trees as is possible.

Air Pilots Organize.

"The Commercial Air Pilot's Association of Canada" is the name of a new organization by which the personnel and practice of aviators in private service will be beneficially influenced and controlled. One extract from the constitution reads: "The association is to try to uphold a high standard of efficiency and professional conduct so that the fact that a pilot is a member of the Association will be a guarantee of his professional ability."

There appears to be much useful service ahead of the Commercial Air Pilot's Association and the Canadian Forestry Magazine will be pleased at all times to give publicity to its work.

What Would Exchange Be?

For the first nine months of 1919 paper, wood and manufactures of wood were exported from Canada to the United States to the value of $163,941,802. The total value of exports of Canadian goods to that country for the same period amounted to $370,246,970.

With our forests supplying over 44 per cent. of the exports to offset our purchases, it is not hard to realize what position our exchange would be in but for the forests.

The depreciated value of our money hurts the patriots pride as well as the pockets of all Canadians. Those who have occasion to visit the United States realize the additional cost to them in purchasing with Canadian money, but it is hard to make the general public realize that the forests of Canada are carrying a tremendous load as the chief support of our credit in the United States. Every effort should be made to protect our forests from fire and to provide efficient forestry management, to enable them to continue in perpetuity the large part they are taking in our foreign trade.—Clyde Leavitt.

Canadian Spruce Supreme.

At a largely attended meeting of the Ottawa Foresters' Club, Mr. E. F. McCarthy, professor of Forestry in Syracuse University, New York State, who, has been engaged during the past season in conducting a working plan survey on the pulp limits of the Spanish River Pulp and Paper Mills, near Sault Ste. Marie, Algoma, compared the forest conditions found in Algoma with those obtaining in the Adiroudacks, and declared that the relative freedom from shade-enduring species (hardwoods) in the former country, would greatly simplify the work of managing these forests to secure a sustained yield of pulpwood. He declared the Canadian white spruce to be easily the best pulpwood tree in America—much more rapid-growing than the red spruce and more hardy than the imported Norway.

The presence of Mr. Wm. T. Cox Chief Forester of Minnesota, lent added interest to the meeting. He outlined some of the chief problems to contend with in his state and chiefly that of protecting the forests from fire. As a result of careful patrol organization and wise expenditure for lookout towers, etc., Mr. Cox now feels confident that although the starting of fires and a certain amount of fires and a certain amount of loss can never be wholly prevented, Minnesota will never again be swept by another such apalling conflagration as for instance the Hinchley or the Cloquet fire.

How France Sustains Her Forests

THE Principles of natural forest regeneration (in France) are first, the admission of sunlight to the forest floor in sufficient quantity to germinate the crop of seeds; second, the maintenance of a suitable shade over the seedlings resulting from a fall of seeds; and, finally the removal of the last of the old stand. These operations are accomplished in practice as follows—The forest is divided into as many cantons as the number of years of the revolution selected (70-120) and a seeding out is made in one canton each year, cutting from east to west. The severity of the seeding cut is determined by the species and the first canton in the series is selected that has a seed year due that year. With the oaks enough trees are taken to leave the balance on 100 ft. centers; sylvester pine at the other extreme would be left on 200-250 ft. centers. The forester sees to it that these seed trees are all sound, healthy, and capable of shedding an abundant crop of acorns, beech-nuts, hornbeam, samaras or pine wing-seeds that fall (whatever may be the species), and the following spring, since the forest floor is warm and sunlit, an abundant crop of seedlings come up, which gives a thick fur of young trees of the same species as the original forest overhead. If not completely successful, a second crop of seeds is allowed to fall before proceeding to the secondary cut. This removes half of the seed trees, leaving enough protection to guard the young trees from sun scorch and early frosts. Five years later they have grown so as to no longer require protection, and the terminal cut is then made which takes the last of the old stand. The reproduction is now complete and it has cost nothing beyond a slight increase in logging expense due to cutting over the same canton three times instead of once as would have been the case with clear cutting. But the cost of planting, not less than $5 an acre, has been saved.

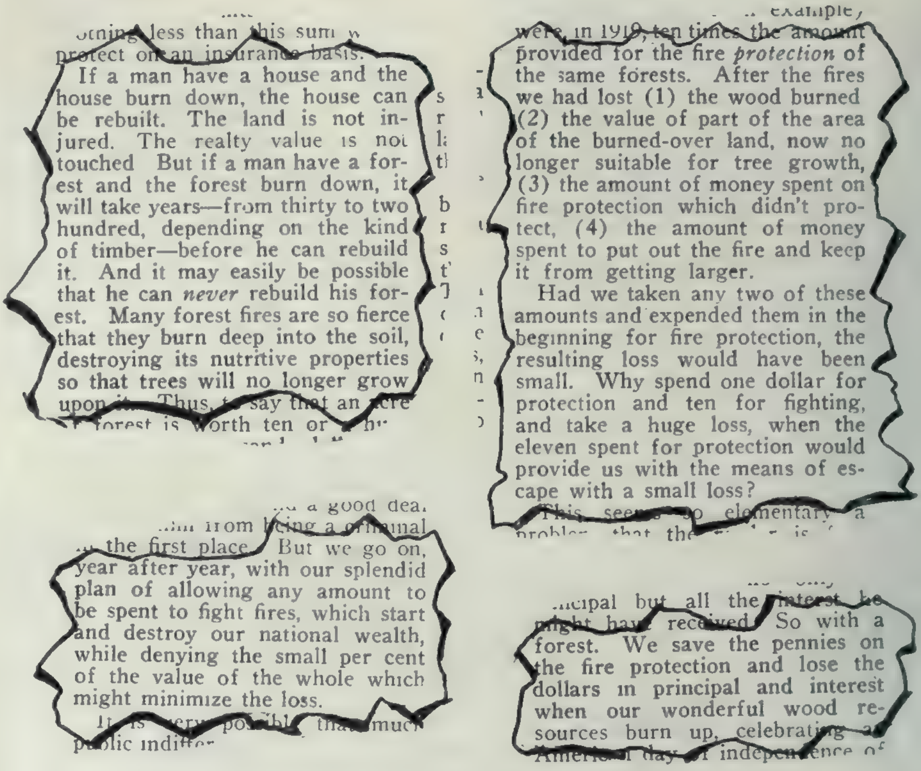
Everything Brings Revenue.

Continuing the regime of the Standard forest, the young growth is left to itself for about fifteen years after the terminal cut. It then receives its first thinning, taking out from one-half to two-thirds of the thick growth. Periodic thinnings follow at intervals of ten years, the general principle being to keep the tops of the dominant trees so that they will just meet when the next thinning comes due, and to keep enough of the sub-stage trees to protect the trunks of the first-class ones from the sun. None of these thinnings are wasted,—and the income from all classes of thinnings amounts to two-fifths of the market value of the final crop. The thicket-stage trimmings compete direct in the markets with coppice products, and the others furnish lumber of increasingly valuable sizes.

Arrived at the end of the revolution, which is at present taken at 60 years for sylvester prine, 75 for oak, and 100 for fir, the seed cut is made in the nearest seed year for that canton (they occur every two to five years for most species) followed by the secondary cut, and then the terminal cut when the new growth on the canton is established. In a French standard forest of an hundred cantons, each year sees one terminal cut, one secondary cut, one seeding cut and ten thinning cuts; in all thirteen cantons being cut over, so that there is plenty of business going on even through the cantons may be only a few hectares area each.

As the system is one which we will adopt in America for nearly all forests not in close touch with rail facilities (such as replanted barrens and worn out pasturage), I will give here a few generalizations as to how to set about converting a wild American forest into a French Standard forest. The first desideratum is uniformity of species, wherefore when you cut cord wood from your woodlot or forest, replant the spt liberally with the species yu have selected, preferably

AIRCRAFT FOR FORESTRY SERVICE



nothing less than this sum w
protect on an insurance basis.

If a man have a house and the house burn down, the house can be rebuilt. The land is not injured. The realty value is not touched But if a man have a forest and the forest burn down, it will take years—from thirty to two hundred, depending on the kind of timber—before he can rebuild it. And it may easily be possible that he can *never* rebuild his forest. Many forest fires are so fierce that they burn deep into the soil, destroying its nutritive properties so that trees will no longer grow upon it. Thus, to say that an acre of forest is worth ten or a hu

... example, were, in 1919, ten times the amount provided for the fire *protection* of the same forests. After the fires we had lost (1) the wood burned (2) the value of part of the area of the burned-over land, now no longer suitable for tree growth, (3) the amount of money spent on fire protection which didn't protect, (4) the amount of money spent to put out the fire and keep it from getting larger.

Had we taken any two of these amounts and expended them in the beginning for fire protection, the resulting loss would have been small. Why spend one dollar for protection and ten for fighting, and take a huge loss, when the eleven spent for protection would provide us with the means of escape with a small loss?

This seems so elementary a problem that the

a good deal
from being a criminal
the first place. But we go on, year after year, with our splendid plan of allowing any amount to be spent to fight fires, which start and destroy our national wealth, while denying the small per cent of the value of the whole which might minimize the loss.

It is very possible that much public indiff

ncipal but all the interest he might have received. So with a forest. We save the pennies on the fire protection and lose the dollars in principal and interest when our wonderful wood resources burn up, celebrating an American day of independence of

The clippings photographed and reproduced herewith are taken from a recent article on the subject of Better Protection Against the Starting of Forest Fires.

Note: There is a growing appreciation of the value of the right sort of airplanes in this work.

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the dominant species already placed there by nature as survival of the fittest. The second consideration is uniformity of age for the trees on each canton. A fifty-year American white oak is 12 to 13 inches in diameter, and at 75 years it will reach 19-20 inches, giving first-class new lumber. Having divided your forest into approximately equal areas as determined by the lay of water courses, ravines, logging roads, etc., arrange your thinning cuts and replantings so as to give you an unbroken series of ages year by year. If there are sufficient seed trees year by year on the spot, you can go direct to standard forest by making a seeding cut each year on each successive canton, eking out any bad spots with hand planting. Doing one canton each year you will have three cuts a year until the fifteenth year when your first thinning cuts begin. Any American hardwood forest can be thus converted into standard forest provided that enough seed trees are already on the site. With conifers, I would advise underplanting for white pine or clear cut and replant with three-year nursery transplants for Scotch and Norway pine.

Rich Crops of Hardwoods.

The French have developed coppice management to a science far in advance of the other nations. The coppice type of forest is based on the principle that certain species of trees, notably oak, chestnut, maple and ash have the property of sprouting from the stump, so that you have a forest of straight vertical branches without any trunks. As the root system is quite as large as with standard trees it is natural that the yield in branch wood is very large and sustained and the sprouts are straight enough to be valuable commercially. In twenty years a crop of four-inch shoots twenty feet long, six to ten to the stump, is available. All the shoots but one are taken, and in twenty years more a second crop has grown from the same stump. The sprout left from the first sprout is called a baliveau and serves not only for a future seed tree, but for shade and protection to the young sprout. Left again on the stump it is called a moderne and is 40 years old and about 8 inches in diameter. At the sixtieth year a third crop of sprouts is taken and the moderne becomes an ancien and bears seed abundantly. The anciens start a thick growth of seedlings all over the forest floor and after two more crops of sprouts the original stumps die, but the seedlings have grown to 40-year trees, which are forthwith out to stumps and the anciens harvested, putting the forest in shape for coppice again. Horse chestnut coppice is usually managed in "simple coppice" with poplar balivage, that is, the whole crop of sprots is taken every twenty years and the poplars held for shade.

The yield in poles, tan bark and lattice stock from coppice management is tremendous and the returns are quick, so that in Central France, where there is a ready market for cordwood, turning wood, tool handles and tan bark, coppice management is very extensive. It requires a rich clay soil as the roots feed excessively. If many of the stumps are allowed to produce modernes and anciens the sprout crop will suffer from shade, but more heavy timber will be yielded so that in the judgment of the forester almost any yield desired for any particular market can be managed. In our own country native chestnut is the principal coppice crop, and telegraph poles, ties, and lumber for interior trim offers the best market; three or more shoots are allowed to grow to 10 and 12 inch poles per stump, yielding at the same time seed for regeneration.

LT.-COL. L. J. D. MARQUIS
Forest Engineer and Mem. Can. Soc. of F.E.;
Quebec Assoc. of F.E.;
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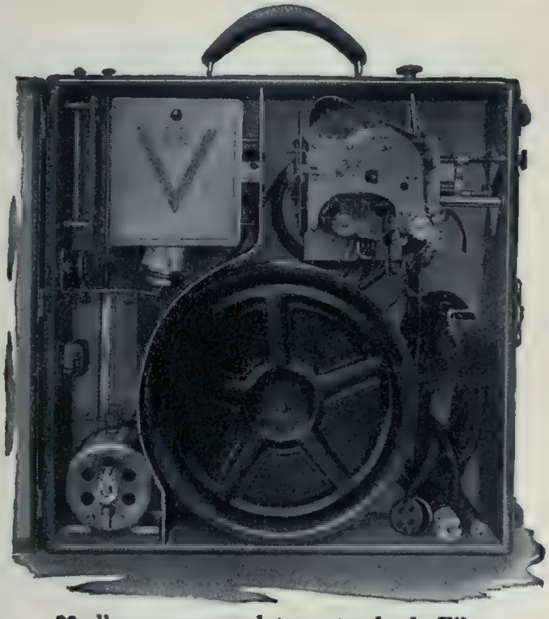
A Tree Policy For Ontario's Highways.

According to the plans of the Ontario department of public works, the permanent highways of the province, particularly those which are international in character, and link up with New York and Michigan highways, will be more than a material asset—they will be things of beauty and by attracting American tourists to the province pay handsome dividends. H. J. Moore is the man entrusted to plan the beautification and see that the work is carried out. His title is highway forester, and those who are conversant with the work of Mr. Moore at Queen Victoria park, Niagara Falls, believe that the government has made no mistake in the choice of an official. In addition to the work to be done at the expense of the province, the idea is to have cities, towns, villages and rural municipalities along the line of the highways co-operate.

Mr. Moore has hopes that this work will even become individual that residents along the line will help in beautifying their lands and thus increase the value of their holdings.

To accomplish this result, during the coming and subsequent winters organizations will be formed in various townships to stimulate an interest in the beautification of the highways. Meetings will be held at various centres, and, in all probability, a president or chairman will be appointed for each organization, who will call occasional meetings to discuss the matter of beautification and to bring to the notice of the people the need of co-operation in this very essential work.

Apart from this, there should be a real national desire for the beautification of the highways. If Ontario is to have the



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desirable class of immigrant that she deserves, the roadways must be beautified. As tourists pass along the highways, they are either pleased or displeased with the appearance. If these roadways can be so beautified as to cause favorable comment from these visitors, they will largely advertise the province on their return to their homes. If, on the other hand, the appearance of the roadways is displeasing, the province may expect nothing but disparaging remarks. It would seem that were the roadways and adjacent areas beautified, there would be a greater desire on the part of tourists and others to locate along them. Were the roadways and adjacent areas properly beautified, only a desirable type of resident would care to live under those conditions.

Forests on Dominion lands in the west are administered with the object of maintaining a permanent supply of timber. In the cast of forest reserves they are primarily intended to supply the surrounding settlements with timber for local use. Pemits are issued to bona fide settlers for their necessary supplies of firewood, fencing material, and timber for building construction. Permits to operators of portable sawmills are granted in order to provide a means of having the timber so granted under settlers' permits, sawn into lumber for the sole use of the settlers. Larger quantities (than those granted under permit) of fire-killed or mature timber are disposed of by timber sales whereby a mill may be established and the timber sawn and sold on the open market, or whereby the firewod, mine timbers, railway ties, or other forest products may be cut and marketed.

In administering these sales the Dominion Forestry Branch keeps always in view the object of perpetuating the supply. Only such trees as are marked or designated for removal for the forest officer may be cut and all material so designated must be cut and removed from the sale area by the date of the expiration of the final permit. The sale areas are examined by qualified forest officers, the timber thereon estimated, and the area mapped. The right to cut the timber is then disposed of by tender or auction following public advertisement.

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British Columbia's Forest Protection System

THE Forest Protection in the Province comes under the head of the Operation office in Victoria in charge of an Assistant Forester and in the field under the District Foresters (of which there are eight) situated in Vancouver, Prince Rupert, Prince George, Cranbrook, Kamloops, Vernon, Nelson and Cariboo. District Foresters are assisted by Assistant District Foresters or Supervisors. The number of Rangers in each district vary

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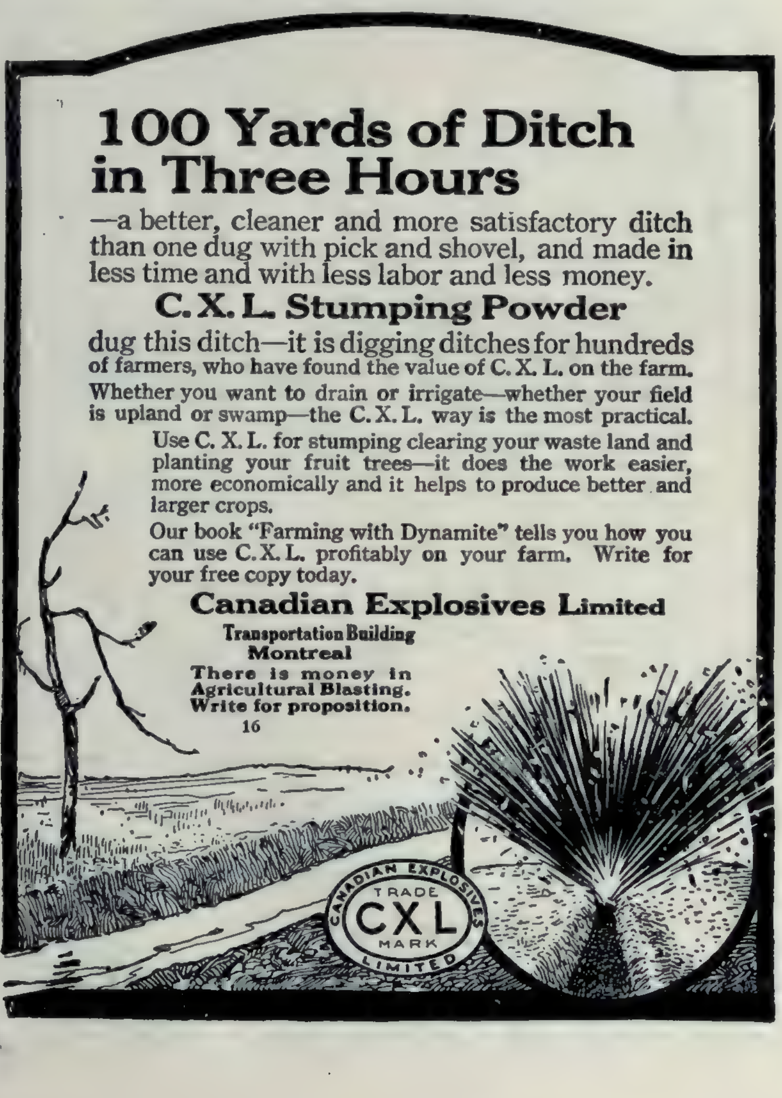

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from four to seventeen, according to the needs and size of a district, the total number for the Province being fifty in 1920. Supervisors vary from two to four. Assistant Rangers who are employed during the fire season, May 1st to October 1st, together with Patrolmen, who are employed during the height of the fire season from two to four months, amounted in 1920 to 156.

The average yearly expenditure on Forest Protection work during the last two years has been $449,000.

There are throughout the Province 43 motor cars, 45 forest fire pumps and on the Coast a wireless telephone service connecting Vancouver, Vananda and Thurston Bay and five launches radiating from these stations are also equipped with this means of communication.

H. R. Christie Chosen

H. R. Christie, M.C., F.E., assistant chief forester in the British Columbia department of lands has been appointed associate professor of forestry in the University of Columbia. Professor Christie will have associated with him members of the staff in engineering, botany, biology, chemistry and other related subjects.

Professor Christie graduated in forestry in Toronto University eight years ago. He had a two-year course at Ontario Agricultural College, taking his diploma in 1908, followed by a four year university course. During 1911 he was in the C.P.R. forest service and the next year with the commission of conservation. In 1913 he entered the B.C. Forest Service remaining 3 years when he joined the expeditionary force and proceeded overseas. In 1916-1917 and the first part of 1918 he was lieutenant with the 8th Field Company C. E., in France, winning the Military Cross. In 1918 he was called to Seaford to become instructor in the Canadian School of Military Engineering. From September 1918 to June 1919 he was with the 16th Field Battery C.E.F., Siberia with rank of Captain.

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Returning last year to the forest service in British Columbia he became assistant chief forester on the promotion of Mr. Caverhill to the chief forester's position. Professor Christie is a native of Amherst, Nova Scotia.

Why is a Ranger?

"Oh, a Ranger is in danger of congestion of the brain, if he tried to keep all posted up on every latest plan. He is but one lone mortal, at the crossing of the ways of a thousand different theories, of a thousand different days. He must be an expert woodsman and a guide and trapper, too; and must know in all emergencies the proper thing to do; how to fix a motor, mend a leg or rope a steer, play a tune on the typewriter to please the diplomatic ear; also how to run a survey, find a corner where it ain't, and, in extra stressful moments, exercise restraint. He must be a sawmill expert, cowboy and lumberjack, and an information bureau, plumb full of statistic fact. And he must be trained in botany, know every growing plant—so's to educate the cattle what they can eat and can't. He must know the birds and animals, the insects and the fish, their every need and comfort, their every wile and wish, including why a wood chuck would and why a dodo don't, as well as why a whippoorwill and why a coyote won't. All professions and sciences and every common trade is the fund of useful knowledge for which he's highly paid. And still there's something to it that holds the Ranger on, when he tells himself and all his friends that he would fain be gone."—The Idaho Forester.

Canadian Pulp and Paper Association

At the annual election of officers held recently at Montreal, Mr. Percy B. Wilson Vice President of the Spanish River Pulp and Paper Mills, Ltd., Sault Ste. Marie, Ontario, was chosen as President to succeed Mr. George Chahoon. Mr. George McKee is the new Vice President.

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Our Work on the Prairies

Lethbridge Herald Editorial.

The Canadian Forestry Association has been doing not only a philanthropic but a national service in encouraging the cultivation of trees, particularly as it applies to the prairie provinces. It is not necessary to go into the value of tree cultivation and the great benefit which it serves. This, thanks to the campaign of the Forestry Association, has become in the nature of a household word. The inestimable service which tree-planting gives is now an every day story.

To speak of Southern Alberta, farmers and others are well aware of the great services which have been rendered by the Forestry Association in its tree-planting campaign, with the visits of the special railway lecture cars. These have brought home the full meaning of tree-planting as it applies to shelter belts, protection against soil drifting, and damage caused by wind. If there is anything that can be done by granting public aid to what is distinctly a public service, there cannot but be a unanimity of opinion that it should be done.

The Forestry Association in order to make its campaign fulfil its object to the utmost limit in this Province is asking its Government for financial aid by bearing a portion of the expense which falls on it. The request is an exceedingly modest one, it being a matter of $2,000 for carrying on its campaign this year. This the Government should readily grant when it is considered how great the economic benefits which the mission of the Association tends to bring about. This is state aid in what is essentially a state policy. The Association at least deserves this encouragement and help in all that it has done and in all that it aims to do. In the returns it will bring it is comparatively a very small outlay. In this part of the Province, at least, action on the part of the Government to meet the wishes of the Forestry Association will be regarded as a highly commendable policy, and will not lack the utmost appreciation. The Association all last year had its expenses borne by a few private subscribers. This is not exactly fair, in the great public service it renders.

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Ford Company Owns a Forest

A recent report in the *American Lumberman* (Chicago) states: "Since the announcement by the Ford company of the establishment of a large mill in the upper peninsula of Michagan, where it has acquired 425,000 acres of hardwood timber, five other enterprises have announced their intention of locating in that territory. The upper peninsula of Michigan, that section of the State located north of the Straits of Mackinac, contains a greater amount of available hardwood timber than any other section of the country, official statistics declaring that there are approximately 40,000,000 feet of available standing timber in upper Michigan."

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Beaver Farming in Canada

THE beaver is an easily domesticated animal and it has been demonstrated that it will breed in captivity. Beavers will thrive on turnips, carrots, potatoes, etc., with some twigs or bark of cotton-wood, ,willow, birch or maple thrown in by way of desert.

Litters average about four, and the young are born in May. Breeding females should be kept in separate pens and provided with a warm nest. Beavers begin to breed when two years old.

The pens should be constructed very much as for foxes, but the fences need not be so high. Wooden fences would, of course, be useless; nothing weaker than galvanized iron sheets or heavy wire netting will stop a beaver's teeth. Precautions must be taken to prevent the animals burrowing out. All pens should contain large pools or troughs of water.

Probably a more satisfactory way of keeping beaver would be to fence in an area which would form a natural habitat. The owner of such a preserve could prevent trapping by trespassers on his property and, with this protection, the beavers would increase and thrive without much attention. A limited number could then be trapped by the owner himself, care being taken to comply with the provincial laws.

There are several beaver ranches of this kind in Canada, but most of them have not been long enough in existence to report on the success or failure of the venture.

Planting by Townships

The councillors of York County, Ontario, have taken a leading part in carrying out the new reforestation plan announced recently by the Ontario Government. Forest conservation is by no means a new topic in York county for as long as fifty years back the York fathers expressed the opinion that "main-

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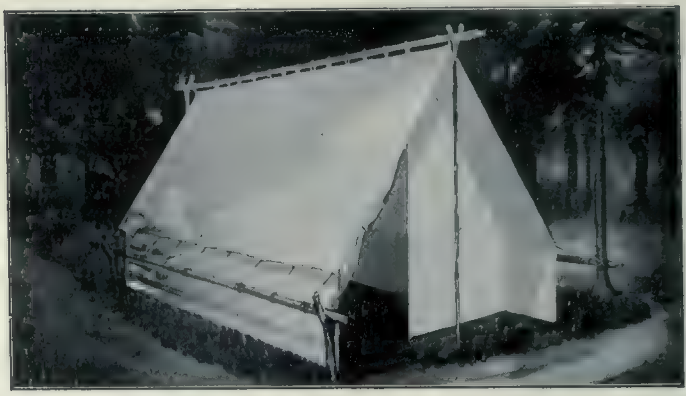

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tenance of the county woodlands would be a manifest benefit both to the climate and agricultural industries of the country," and in the depletion of the forest they foresaw a serious menace to the industrial life of Ontario. Even then the small streams were beginning to dry up, freshets grew stronger every spring as the forests disappeared and the yearly toll of dams washed away never to be rebuilt was growing greater. Small villages that had grown up around small waterheads were beginning to decline, sawmills, flourmills, woolen mills and breweries that once flourished in large numbers were even fifty years ago being forced out of existence.

Spruce a Musical Wood

American Forestry finds that spruce takes up and transmits vibrations more perfectly than any other wood that can be had in adequate quantities. It says, "The cause of spruce resonance is thought to lie in the wood's long fibres and in their uniform or regular arrangement. The fibres vibrate like so many taut cords. Of a total of 43,000,000 feet of softwoods estimated to be used in the manufacture of musical instruments in this country each year, more than 29,000,000 feet is spruce. White pine is second on the list of softwoods with 9,000,000 feet used annually."

Fires From Railways.

Charges of neglect to provide protection against forest fires were made against the Canadian National Railways at the annual meeting of the Woodlands Section of the Canadian Pulp and Paper Association and the Quebec Forest Protective Association at the Windsor Hotel, Montreal, on January 19th. A motion was unanimously adopted favoring inclusion of the Canadian National Railways for fire protective purposes within the jurisdiction of the Board of Railway Commissioners in the same manner as the privately-owned railway systems.

J. F. Gregory of St. John, N.B., led the discussion and described the present status of the Canadian National Railways in relation to forest fire prevention, pointing out that while the Government of Canada imposed regulations upon the Canadian Pacific Railway in regard to

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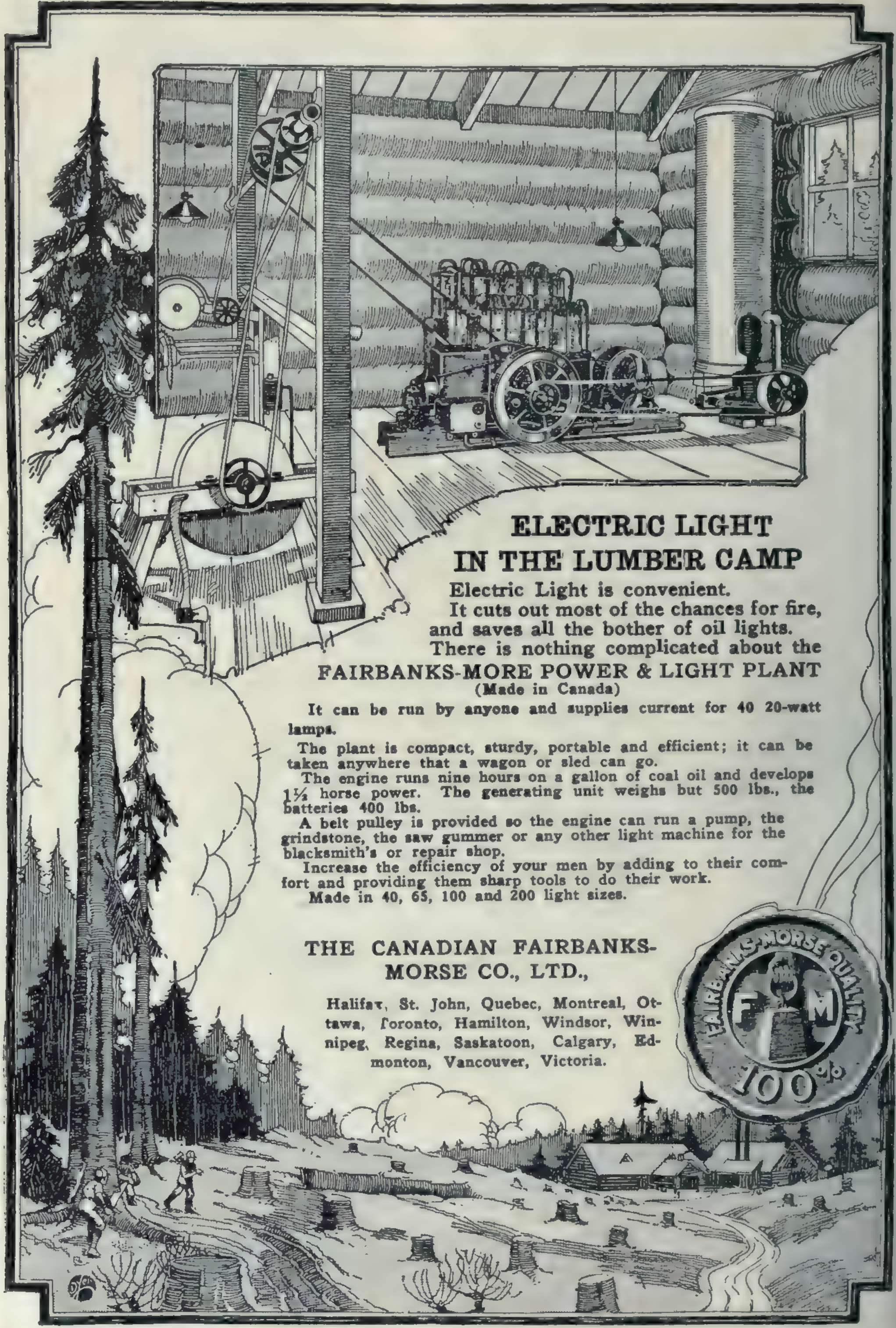

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forest fire prevention, such regulations did not apply to the government-owned roads. Mr. Gregory's remarks were endorsed by Mr. Arthur Graham, Chief Inspector of the Ottawa River Forest Protective Association and Mr. Henry Sorgius, Manager of the St. Maurice Forest Protective Association and others. Mr. Ellwood Wilson also took a leading part in the discussion. A defence on behalf of the Canadian National Railway was entered by Mr. H. W. Sharpe, Master Mechanic of the Canadian National Railways.

Forestry and Irrigation

From a Report on the Lethbridge Northern Irrigation District.

For general up-keep of the main canal, in the removal of sand, silt, etc., it may be estimated that, out of the total length, 30 miles may involve an annual expenditure of $300 per mile, or $9,000; say $10,000 per annum. This burden will be affected by the careful location of fencing, as has been mentioned in connection with the cost of construction, and some part of it may be reduced by judicious expenditure on *forestry*, along the canal line. An annual expense of $2,000 in such work may materially reduce the annual cost of cleaning, but, as some time would elapse before its beneficial effect would be felt, the allowance of $10,000 should be reckoned upon.

A Wedding in the Air

From a brief note in the Indian papers to hand it appears that the "wedding in the air" notion has spread to India. Mr. Charles Manson Mann, of Calcutta, was married on the afternoon of Oct. 17 to Miss Vera Kathleen Gardner in a Handley-Page aeroplane flying over Calcutta. There was a full and complete wedding party on board, consisting of the couple and eight guests as well as the officiating clergyman and the best man. Capt. Stackard, a friend of the bride and bridegroom, was piloting, and the machine went up to 6,000 feet in 45 minutes. Then the engines were shut off, the aeroplane put into a slow glide, and the ceremony commenced. Without the noise of the engines there was silence on board, so that the words of the service were quite clear and audible. The ceremony went off without a hitch, and inside an hour from the time of the start the machine had landed and the bridal party had debarked. A cinema operator was amongst the guests, and he took a complete film of the ceremony.

Air Service in New Brunswick.

Major Gordon, representing the Air Board of Canada, conferred with the New Brunswick Forest Service recently regarding the establishment of an air patrol in New Brunswick next season.

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HAVE YOU?

By Orville Leonard.

Have you ever seen the smoke clouds from a forest fire burning? Have you ever lived for hours in that crackling, bright inferno? Have you had your shoe soles burned off by those dead looking white ashes? Have you seen men shouting wildly, though you could not hear their voices for the roar and hiss of leaping flames and the fierce wind they engendered? Have you ever seen a country where the furred with living fire and wondered if you'd ever live to feel the cool wind blowing? Have you ever seen a rancher driven from his fired homestead, while years of labor on his fields were wiped out in an hour? Have you ever looked down a line all hedged and feathered wild things have been burned up, every one? And have you seen that country when the fire fiend has finished—the blackened stumps of noble trees, the white ashes, burned bare rocks, no living thing—black, deathlike desolation brooding over all?

If you have, you'll see that your match is out and look where you throw your cigarette.

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We have assisted in the initial financing and distribution to investors of the following securities which will be quoted on request:

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Howard Smith Paper Mills, 8% Pfd. and Participating Stock.
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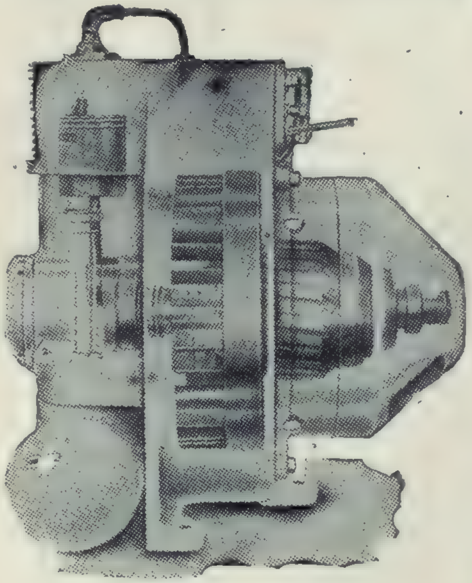

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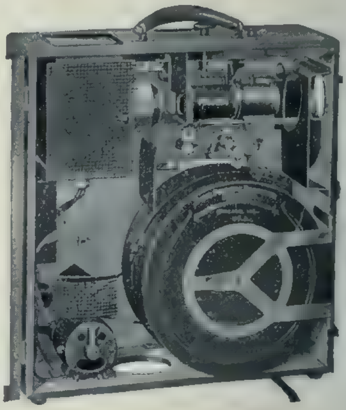

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History of Walnut.

It has been commonly stated and believed that walnut was not found in Europe before the Romans introduced it from Asia, and that the Circassian walnut which they brought in and planted became the English, French and Italian walnuts of the present time. Geological data worked out and compiled by Mr. Edward W. Berry, of John Hopkins University, and published by the Smithsonian Institution, throw serious doubt on the tradition that the Romans introduced walnut into Europe. On the other hand, it appears certain that walnut was in Europe some millions of years before the Romans appeared on the scene. The evidence is found in the records of geology, the imprints of leaves, fruit, flowers and twigs in rock strata, clays, peat and lignite. It can be taken for granted that where walnut leaves and fruit existed, there was walnut timber in the vicinity, and by that line of reasoning the existence of walnut is proved in many parts of Europe, and in geological ages running back to that known as Cretaceous. How long ago that was cannot be definitely determined in years, for there is no known method of translating geological records into measured time. It is commonly believed, however, that the Cretaceous period was not less than 5,000 years ago.

This would place the walnuts among the oldest residents of the hardwood forests. Yellow poplar is as old, and hickory is not much younger. They are believed to have been among the first hardwood trees to appear on earth, but the pines are older. During the past time the different species of walnut grew entirely around the world in a belt corresponding in a general way with the North Temperate Zone, but extending into the Torrid Zone in places, and into the North Frigid Zone in Alaska and Greenland. The ancestors of our black walnut and butternut, and of Circassian walnut were in the ancient forests; and there were no fewer than two dozen other species of walnuts which left the imprint of their leaves in the rocks, but those walnuts have since perished from from the earth.

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SIZE UP EVERY TIMBER FIRE AS YOUR PERSONAL ENEMY AND GET AFTER HIM.

Put Out Your Camp Fire;
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A mile of trees "shorn" to allow of the passage of wires. As thousands of stubs have been left, nearly every tree will die. In winter the effect of "shearing" is horrible. Co-operation will largely prevent such mutilation in the future.

Trees dehorned (headed back) to allow of the passage of wires. So mutilated they will die. Observe the stubs!

CIRCULATION: 13,000 COPIES MONTHLY. ROBSON BLACK, Editor

THE ILLUSTRATED CANADIAN FORESTRY MAGAZINE

VOL. XVII. KINGSTON, CANADA, MARCH, 1921 No. 3

Address all communications to Suite 224, Jackson Building, Ottawa.

Ontario Will Stop Tree Butchery Along Roads

By Henry J. Moore
Forester, Public Highways of Ontario

Stringing of wires causing ruin of trees is now under control

NEVER before was there such a real desire to save the valuable shade trees of our roads and streets as there is to-day. The ruthless manner in which they have been butchered, in nearly every case where wires have been strung has aroused a feeling of resentment in the hearts of all lovers of trees, and as an outcome of this feeling steps are being taken to forever end the butchery.

Along many of our residential streets, once beautified by magnificent trees, now mere stubs remain, these slowly dying tell their pitiful tale to the passer by, until the day when they will of necessity have to be removed as dead things and be consumed in the furnace or stove as the case may be.

Many of these trees 75 or more years of age, gave of their shade and beauty before the oldest living resident was born, and the pity of it is that still in the vigour of youth and in the fullness of their glory they were sacrificed. Things which should have been reverenced were mutilated to finally die, and give way to a line of unsightly wooden poles.

What is the reason of this mutilation? Public demand for telephone, telegraph, electric light, and power service. These demands made it imperative that wires be strung along tree lined roads and streets, and as all of the aforementioned companies know, interference from branches of trees cannot be tolerated, as the service under such condition will cause annoyance to customer and company alike, short circuits, and loss of current always do. These are common results of interference from branches. It is thus necessary that when new lines are strung good clearance from trees is essential, and so every branch and even twig in the way must be eliminated. In the case of high voltage electric lines several feet of clearance is necessary in all cases where branches are likely to bend with the weight of snow or sleet, or to be blown against the cables, thus the work of clearing the lines is a problem which all companies have seriously to face.

Control of Company Cutting.

There are but two solutions of the problem—the companies will either have to place their lines on private right of ways, or expert supervision over the

Tree in foreground pruned to allow of the passage of wires No mutilation. Note the branches on the road. This tree will live and continue to be a thing of beauty.

pruning of trees will have to be exercised, wherever tree growth exists along their lines. When such conditions prevail much cutting of branches has invariably been necessary, and it is the manner in which these have been removed which has kept the indignation of all tree lovers at boiling point. It is unfortunate that generally the men who cut the trees and the public do not realize that when stubs are left upon the trees the doom of the latter is usually sealed, and that decay, which slowly and insiduously enters the wounds, will eventually cause the death of the subjects.

A real national effort should be made to interest county and city councils and other muncipalities in the welfare of the shade trees. Unfortunately, in the past few people have been sufficiently interested to take steps to end the evil of mutilation. Thus the burden has been left to a few citizens, or a few organizations, such as Horticultural Societies, and Chambers of Commerce.

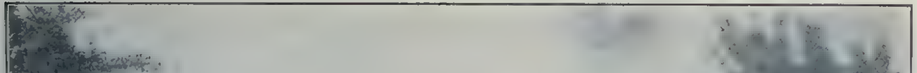
The care of the trees in our municipalities should be entrusted to the Parks Board, where such exists, and the actual work of pruning should be supervised by the Parks Superintendent or Forester, or by men under the control of these officials. The pruning has been done largely without supervision, and in some cases the authorities have not interested themselves in the past. Thus it would seem that the various companies are not solely responsible for the injury to the trees.

Are our God-given shade trees to be mutilated and slaughtered forever? What would be the appearance of our streets and roads without these? Municipal Councils, shake off your apathy! Interest yourselves in the trees. Should a little money for the appointment of men qualified to care for them be witheld. You spend lots of money for purposes less worthy than this. Early this year, start a movement for the preservation of the trees and you will give to the next generaton a heritage of beauty. Your towns and cities will then vie with each other for all will be beautiful, even in your own time much can be done to make them more attractive. Nothing can more eloquently express the intelligence of Municipal Councils than well planted streets on which the trees are preserved and protected from injury.

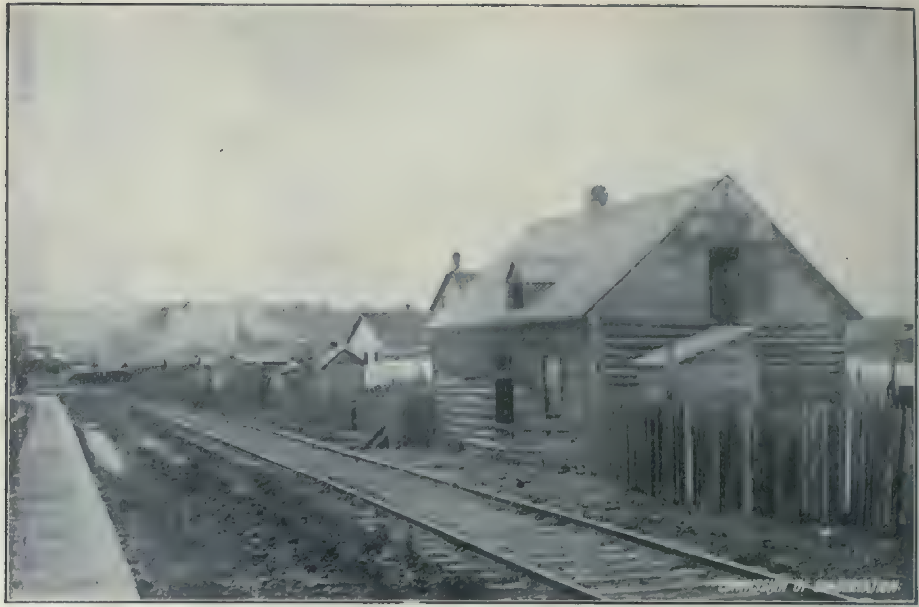
What Ontario is Doing.

It may be of interest to readers to know that the Department of Public Highways of the Province of Ontario has called a halt to the mutilation of trees along the highways under its jurisdiction. No person or company may, without permission, cut or remove branches from the trees, and in all cases where such permission is granted, the work may only be done under the supervision of the Forester, or such person whom he may appoint. The various companies pay for all the pruning, which is usually done by men in their employ-

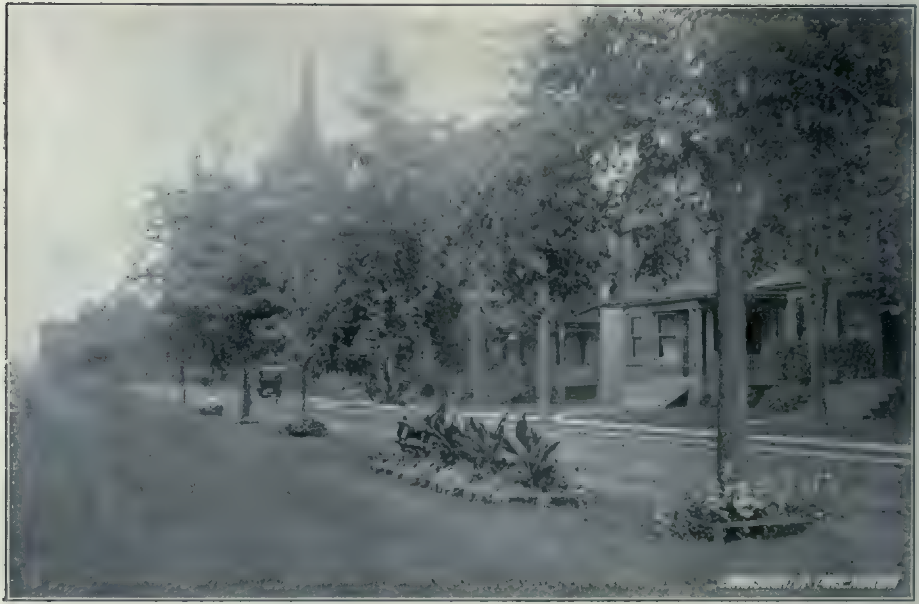
The monotony and discomfort of travel along a dusty road in summer is much relieved by the frequent elm or the cool cluster of bushes.



A suburban driveway made beautiful by trees planted at frequent intervals.



UGLY AND DANGEROUS SLUM CONDITIONS ADJOINING A RAILWAY.
A few ornamental shade trees would improve the appearance of this locality beyond recognition.



BOULEVARD PARALLELING THE RAILWAY.
Trees give to this neighborhood beauty and health. Contrast the two photographs. The care which has been taken to preserve the trees along this highway has been a great factor in attracting residents.

It is well within the bounds of possibility, however, that the larger companies, whose cables and wires are strung along our highways and streets, will appoint expert tree pruners, with the result that in future the trees will be pruned without mutilation, and to the satisfaction of all concerned.

Trees for Planting in Ontario

By Arthur Herbert Richardson, Ontario Forestry Branch

THE Ontario Government, through the Provincial Forestry Branch, desires to assist land owners in Ontario to improve their woodlots and reforest waste portions of their holdings. It is preferred that besides supplementing the existing wooded areas on farms, areas such as steep hillsides, sandy, rocky or gravelly spots, swamp land, portions of farms cut off by streams, etc., should receive first attention. Planting of evergreen belts about open borders of woodlots is encouraged, but trees for hedges, ornamental planting, city or park purposes, will not be supplied. The material sent out is meant primarily for forest plantations.

What Forestry Branch Will Do.

In so far as is possible, the Forestry Branch will assist in the growing of forest plantations or woodlots by giving advice, through one of its officers, as to preparation of soil, species to plant, manner of planting and care after planting. It will also supply a limited number of trees for this work, free of charge.

It is suggested that persons contemplating waste land planting make a start of one acre the first season. Two acres will be the largest area for which the Department will undertake to furnish planting material in any one year. Larger areas may be planted by arranging to continue the work throughout successive seasons.

What Prospective Planters Must Do.

Persons wishing to take advantage of this co-operative plan of forest tree distribution should secure an application from the Branch; fill it out and return promptly. They will be informed when the trees are being shipped.

As stated above, trees are supplied free of charge, but the person receiving such material shall pay the cost of transportation by express to his nearest express office. One thousand to two thousand plants will range from 100 to 300 lbs. in weight. This season the trees will be shipped by Canadian Express from St. Williams, Norfolk County. If the applicant desires to know about what the express charges will be he should find out from his local express agent, the rate per 100 lbs. from the above shipping point. It is not considered safe to ship these plants by freight, and the Forestry Branch cannot receive money to prepay transportation charges.

Some Other Considerations.

Applications for trees will be received and filled as long as the stock is available and it is not too late in the season for planting. Applications should all be received early in April. If, however, an applicant is unable to receive stock in

Many hundreds of thousands of young pine seedlings growing at St. Williams, Ontario, in the Provincial Government Nursery. These trees will be ready this spring for permanent planting on waste lands. See accompanying article by Mr. Richardson.

a certain year, owing to the supply having been exhausted, his disappointment should not be too great, as his application may be held over, if he so desires, until the following year—and after all, a year in the life of a tree is not a great deal.

For the last few years the supply of planting material has not been equal to the demand. This is because it takes three years at least to grow a tree ready for permanent planting, and world events of recent years has seriously interfered with all such work. But the Branch soon hopes to exceed any past records in nursery stock output.

A list of trees, with their soil preference, available for distribution this spring, is here subtended:

Suited to thin soils on limestone ridges: Scotch Pine.
Suited to very poor sand: Scotch Pine.
Suited to light, sandy soil: Scotch Pine.
Suited to sandy loam: Scotch Pine, White Ash, Red Oak and Black Locust.
Suited to loam: White Ash, White Elm, Sugar Maple, Black Locust, Walnut, Butternut and Red Oak.
Suited to clay: Soft Maple, White Elm.
Suited to wet soils: Soft Maple, White Elm.

Address all communications to ONTARIO FORESTRY BRANCH, Parliament Buildings, Toronto.

Greece Pays Penalty of Deforestation

By Dr. B. E. Fernow

Dean Emeritus, Faculty of Forestry, Toronto

"Infertile sand and dreary rock waste remain" as legacy of the golden age

THE history of Greece has been so unfortunate and political conditions so unsettled that only lately efforts at improvement in economic conditions could hope to receive attention. For centuries after Greece had become a Roman province (146 B.C.) it changed rulers, Romans, Byzantines, Franks, Venetians, following each other, until between 1460 and 1473, it came under the Turkish yoke. As a result of an insurrection started in 1821, freedom, but no settled order as yet, was attained in 1829 through the assistance of Great Britain, France and Russia.

By the time this new era had arrived there was probably little valuable forest worthy of the name left, except in the inaccessible mountain districts.

Forest Conditions.

Although certain districts, like Attica, were already practically denuded in Plato's time, there is little doubt that originally the whole of Greece with small exceptions was a continuous forest. The destruction of the forest, protected by thousands of gods and nymphs in holy groves, proceeded slowly under the regime of the ancient Greeks, until the fanaticism of the Christian religion led to a war against these pagan strongholds, and the holy groves were reduced by axe and fire. Turkish misrule for centuries, over-taxation, reckless cutting, extensive herding of goats and sheep, and fires have reduced the forest area until now it occupies only 12 or 14 per cent. of the land area (25,000 square miles). In 1854, a survey developed about 2 million acres of woodlands (probably an excessive figure) for the now 2.5 million people, while 67 per cent. of the surface is a useless waste, and only 20 per cent. under cultivation, so that the general aspect of the country is desolate. The many islands are entirely deforested, and so are the seashores.

"Where in olden times dense shade poplars stood, now only infertile sand and dreary rock waste remain."

The forest in northern and middle Greece is confined to the two rugged mountain ranges with numerous spurs which run parallel, north and south, with Mt. Olympus (nearly 9,000 feet) and Mt. Pindus (6,000 feet) the highest elevations. The large fertile plains of Thessaly and Boeotia are forestless. So is the large Arcadian plateau of the Peloponnesus, and the other smaller, hot but fertile plains and plateaus. The most valuable conifer forest is found on the higher ranges between the 2,500 and 5,000 foot level, below the snowclad mountain tops, where especially two species of fir, Abies Apollinis and Abies reginoe Amaliae (a species remarkable for its sprouting habit), with other firs and several species of Juniperus and Cupressus, form sometimes extensive forests. Other common trees are chestnut, sycamore, several species of oak and poplar, and, on the coast, Pinus halepensis.

The firs occupy about 35 per cent. of the forest area, oaks and deciduous forest 45 per cent. Among the forest products which are exported, we find galls, vermillion and sumach prominent.

A Land of Lost Fertility.

It is believed that Greece in ancient times was more fertile than it is now, and that the deterioration is due to deforestation. Undoubtedly soil conditions favored such deterioration, for, with the exception of the Pindus range, which is composed of metamorphic rock, a poor, dry limestone is characteristic of the country except where fertile, alluvial and diluvial deposits cover it in valleys along the coast. The climate is, however, so favorable that even the poor soil would readily reclothe itself if left alone. The winters are short, hardly three months, and with hardly any snow or ice except on the high mountains, making the vegetative period nine months; and, with temperature ranging from 20 to 106 degrees F.; rainfall average 400 mm.; the summers, to be sure, rainless and dry, but the other seasons humid, somewhat less than in middle Europe, rapid growth is the result of these conditions. But the continued pasturing of goats and sheep some six million—prevents any natural reforestation. Increased taxation on this industry has had no effect, and the practice of permitting the people to gather dry wood by setting fires, which also serve to improve the pasture; perhaps nowhere are forest fires more frequent, in spite of heavy penalties. That a baneful influence on the water condition and river flow has been the result is historically demonstrated by Chloros.

In the mountains some fine and quite extensive bodies of fir still exist, lack of transportation having preserved them. Elsewhere the rights of user, and the herding of goats are so well established that reforms appear, indeed, difficult.

Firewood, 3 loads for each person supposed to be taken from the dead or otherwise useless trees, and small dimension material is free to all. For the right to cut workwood, the government charges a tax of 20 to 30 per cent. of the value of the material, the price for this being annually determined. On the material cut in private forests, the government also levies a tax of from 12 to 18 per cent. of its value. This pernicious system of promiscuous cutting leads to the most wasteful use imaginable, not only high stumps. but large amounts of good material are left in the woods, so that it is estimated that hardly 50 per cent. of what is cut is really utilized. The cut, as far as the tax gives a clue to it, amounts to round 2.7 million cubic feet workwood, but with the firewood included it was estimated that near 90 million cubic feet are cut annually. Importation to the amount of 1.5 million dollars, mostly from Austria and Roumania, makes up the deficit in work material, especially for the box factories which manufacture the packages for the large export of currants, some 2 million boxes. The tax during the decade from 1862 to 1871 produced an annual income of $600,000, a little less in 1895.

The forest has been from olden times, and is now almost entirely State property (some 80 or 90 per cent.) and in nearly all the remaining, private, communal and cloister property the State has a partial ownership or supervision. The waste land of probably 3 million acres extent also belongs to the State, the whole State property covering over 30 per cent. of the land area.

Development of Forest Policies.

A first definite attempt to regulate matters was made by King Otho of Bavaria, who took a personal interest in this forest property, and instituted for each province forest inspectors under one chief inspector, with forest guards, to prevent devastation by fire and theft. The mistake was made of employing in these positions superannuated Bavarian army officers, who were merely a burden on the treasury. No management or even regular fellings were attempted. The population could, as before, supply its needs upon permits, always granted, from the governor of the province, one of the forest guards being supposed to vise these, and to see that the wood was properly employed, not, however, to supervise the cutting.

In 1877, further legislation was had, instituting in the Ministry of Finance, a forest inspector, technically trained, with two assistant inspectors, also technically trained, to superintend the outside work. A forest survey was begun in 1879, but interrupted in 1880 for lack of funds and personnel. The same law placed the duty of guarding the State property in the hands of the general police or gendermerie, 50 officers and some 340 guards, and during the fire danger (June to October) 110 more, being detailed for this service under direction of the Minister of War. The pernicious permit system, however, was continued.

Dr. Chloros, who obtained his education in Germany, became finally Forest Director and was responsible for securing further legislation in 1888, the object of which was, as a first step towards improvement, to survey and delimit and round off the State property. It provided that enclaves, and all absolute forest soil was to be expropriated. If no amicable agreement with the owner could be reached, the price was to be determined by the net yield which had been obtained from the property during the last five years, capitalized at 5 per cent. No attempts, however, at an efficient organization or change of the destructive permit system were made.

Private Forestry Discouraged.

By general law, the State has the right to surveillance of private property, although the extent of this right is not fully defined. The government may take for its own use, by paying for it, upwards of one-sixth of the annual cut; it collects a tax of 12 to 18 per cent. for all woodwork cut; it forbids the pasturing of woods that have been burned within 10 years, and obliges all owners of over 1,200 acres to employ forest guards. This and other interference with property rights naturally acts as deterrent to private forest management. A notable exception is the small private royal forest property near Athens, which, since 1872 under a Danish forester, appears to have been managed under forestry principles.

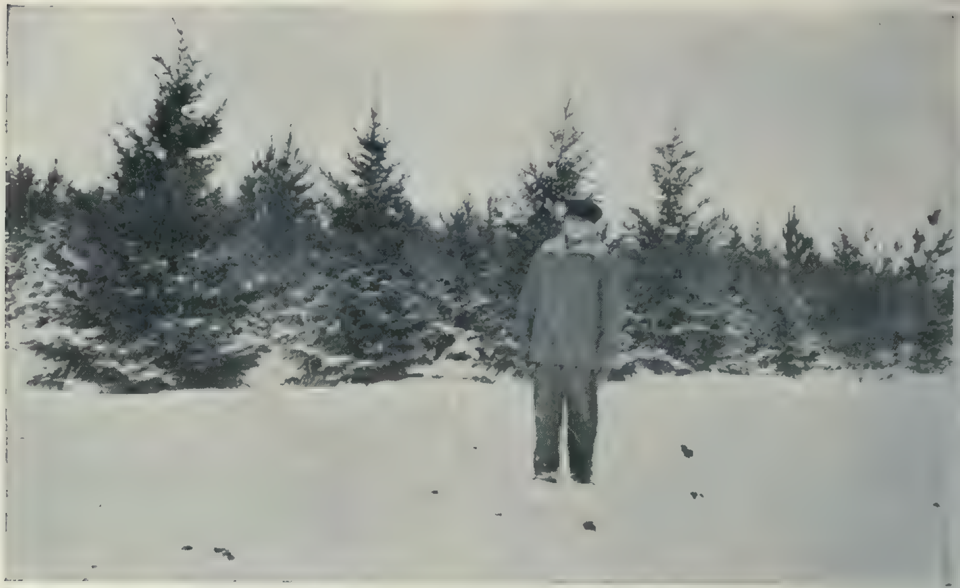
A thorough re-organization of the forest service was effected in 1893, when 20 district foresters were employed, the number of forest inspectors was increased to four, and a regular Division of Forestry was instituted in the Finance Department. The general police or gendarmerie was continued as forest guards. Until a native personnel could be educated, foreigners were to be employed for the making of working plans.

Reforms Came Slowly.

Yet in 1896, the then Director of the Forest Department, a lawyer, still complains of the absence of a proper organization and of any personnel with forestry knowledge. Apparently no progress had been made. In that year, however, the gendarmerie was to be replaced by forest guards (52 superior and 298 subaltern), who were to be appointed from graduates of a special secondary school, which had been instituted at Vytina some two years before. This replacement could, of course, not be effected at once, since hardly more than 25 men could be graduated annually; hence even this improvement in the lower class police would not be completed for six or eight years. No steps had been taken to educate officers for the higher grades, and in this direction, propositions merely were discussed.

In 1899, a change in the permit system was made, but hardly for the better, justices of the peace being empowered, under certain conditions, to issue such permits. Nor do we find in 1901 anything more than expressions of good wishes, and desire for further legislation, besides some attempts at popular education through the formation of tree-planting associations under the patronage of the Crown Princess. In 1905 no change in conditions were reported. Forest fires still continue as a common occurrence.

While the government makes efforts to improve conditions, the indifference of the people and the long established abuses prevent rapid progress at reform.



Mr. Stevenson's teaching of Prairie tree planting is usually accomplished by successful examples. The photograph shows what he has been able to do with native white spruce, Scotch pine and jack pine under Prairie conditions. These trees are eight years from their seedling stage

Evergreen Growing on the Prairie

By M. J. Stevenson, Morris, Manitoba

(*A practical farmer who has made a striking success of tree planting*)

IT has always been a mystery to me why more prairie farmers do not plant trees. I am sure there can be no comparison between a well treed prairie home and one situated out in the open and unprotected. Take a home out on the bleak prairie in winter, bombarded by every storm that blows, it is to say the least the picture of desolation.

Time and again we have seen the bleak, bare farmstead transformed into a thing of beauty by the judicious planting of trees. And yet a great many farmers in the western provinces are without a tree or shrub of any kind. Time was (away back in the early eighties) when tree planting on the prairies was a good deal of an experiment. But this stage has long since been passed, as beautiful planted groves in almost every district shows. While it is always best at first to plant some hardy, quick-growing, deciduous trees on the bare prairie; yet there is nothing like the evergreens either summer or winter.

Surround a piece of land with some of the hardy, quick-growing deciduous varieties, preferably willows, and when these have become somewhat of a shelter, then plant your evergreens in the centre.

One objection to the planting of conifers on the prairie is they have always been regarded as very slow growing. This is a mistake. We must remember their system of growth is the very opposite of the deciduous varieties. Take the Manitoba Maple for instance. It makes most of its rapid growth during the first ten years, growing more slowly year by year till it is twenty-five or thirty when in this climate, and on the upland prairie it comes practically to a standstill. Not so with the native white spruce. After it gets its root system established, which takes from two to four years after transplanting, it will grow from one foot

A REAL MENACE IN THE TREELESS WEST.

This picture may puzzle the Eastern reader, but is only too intelligible to the prairie farmer living in districts where soil drifting has become a serious consideration. The photograph was taken last summer by the Western Lecturer of the Canadian Forestry Association near Nobleford, Alberta, on the Alderside Division of the Canadian Pacific Railway. Because of unobstructed gales the fine top soil of many farms was blown across the country and heaped so high in places as to obscure fence posts and to bury the railway tracks. In the area shown here the farmer had placed three successive sets of posts, one on the top of the other, as the drift grew deeper. At one place steam shovels were used to remove the soil from the tracks. The general adoption of tree planting in the form of thick shelter belts will almost certainly obviate this serious menace to western farming.

to two feet a year, and in twenty or twenty-five years will be away taller than the maple, and will still be in the fullness of its glory when two or three generations of maples have grown to maturity, died and been consigned to the woodpile.

White Spruce His Favorite.

I have twenty-six varieties of conifers growing on my farm here, but in my experience covering over thirty years in tree growing in Manitoba. I give the native white spruce first place. It is indeed a marvel. It is the one tree the good Lord invented to clothe desolation with beauty and comfort on the bare, bald prairie. In my experience here I find it makes a great difference from what locality we get our seed trees. In all cases we must try to get our seed or trees from a country with a climate similar to our own. For instance, white spruce grown here from eastern seed, although of the same species, is not hardy. The same holds good with the Rocky Mountain varieties.

In 1907, I procured seed of the Western Yellow Pine (Pinus Ponderosa) from Colorado. The trees from this seed were not hardy; but later I secured seed of this species from the bad lands of Dakota and these have been entirely hardy here.

Of the twelve or thirteen varieties of conifers growing on the east slope of the Rockies, all can be made to grow on our prairies if we are careful to procure our seed or trees as far north as possible.

The question of tree-planting and forest conservation is a vital one in Canada already, as the country settles up we will require vastly more supplies such as lumber and other forest products, and the end of these commodities is already in sight.

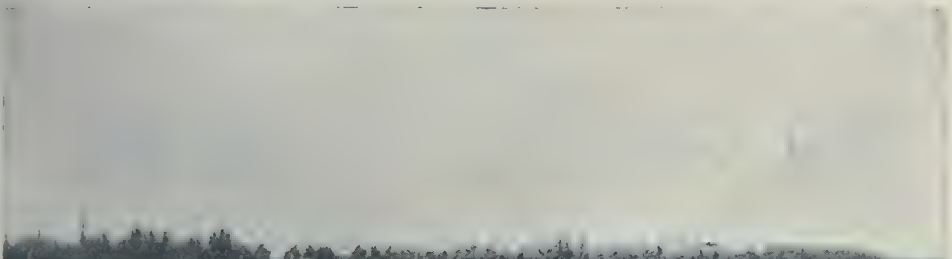
GETTING READY FOR THE PRAIRIE TOUR.

Once more the Canadian Forestry Association will send into Manitoba, Saskatchewan and Alberta this Spring its "Tree Planting Car" which achieved such notable success in 1920. This year the interior will be equipped in a rather unique manner so that special seating will be constructed on a sloping floor, thus giving all present an unobstructed view of the motion pictures and the lecturer. As many as 125 people have been accommodated in this car at one time, although the normal seating capacity is for 72.

THE EFFECT OF TREE PLANTING ON THE PRAIRIES.

This interesting photograph was taken in Assiniboine Park, Winnipeg, and illustrates the profuse growth of trees and shrubs on what is essentially prairie soil. By a little effort and relatively small expense, almost any prairie town can achieve results quite as attractive.

A young shelter belt on Mr. Sovez's farm near Alsask, Alta. Russian poplar trees four to five years old with Mr. Sovez standing on left.



'Islands" of trees, planted by Mr. Archibald Mitchell on the Canadian Pacific Railway Company's farm at Strathmore, Alberta.

School Children and Grown Ups.

The Canadian Forestry Association sends to hundreds of schools Travelling Lecture Sets, consisting of 60 lantern slides and an entertaining manuscript. The following letter is typical of the reception given to this branch of our educational work:

Brussels, Ont., Feb. 8, 1921.
Canadian Forestry Association:

The slides on Forest Conservation were shown to High and Public school students and teachers yesterday afternoon and lecture read. The pupils were greatly interested and expressed their approval of them by hearty applause.

In the evening they were shown gratis to adults of the community at Family Theatre. Hall was packed—movies were shown as well. Many expressed to me their pleasure in viewing the beautifully colored scenes and their appreciation of the instruction given through lecture.

We used some slides to point out to our Lower school students character of glaciers exhibited, and in similar manner used the slide on lumbering industry in Nova Scotia and New Brunswick to emphasize that industry as presented in their geography lessons

Very much indebted for use of same.

Yours truly,
BENJ. S. SCOTT,
Principal.

From a Commercial Nursery

Prairie Nurseries, Ltd.,
Estevan, Sask.

We find the Canadian Forestry Magazine to be of much help to us and are pleased to note the high plane upon which your work is carried on.

Yours very truly,
T. TORGESON,
Managing Director.

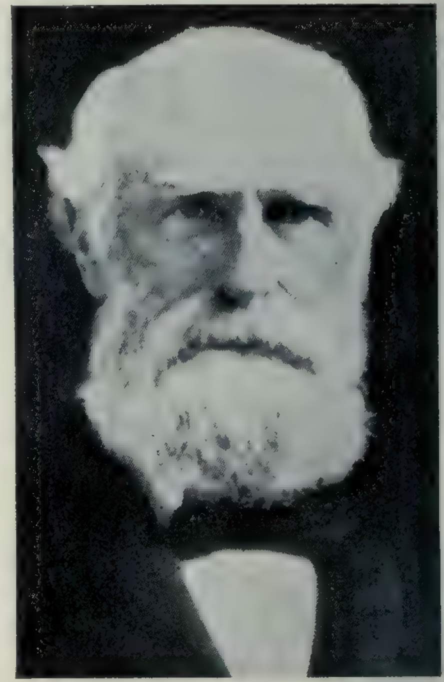
The average cost of forest fire prevention in the United States is 2½c per acre.

It is claimed that laboratory studies in the United States have resulted in saving $1,000,000 a year in box industry alone and that research is capable of saving $5,000,000, annual loss in pulp decay.

Pennsylvania estimates that its lack of forests costs the people of the State $100,000,000 yearly.

Fires and destructive logging cost the American people $25,000,000 a year.

A True Servant of His Country.



WILLIAM LITTLE.

According to the Constitution of the Canadian Forestry Association, the Board of Directors shall include the past presidents who have held office since 1909-10. Under such a regulation, the Association would have lost from its Board this year Mr. William Little, who since the founding of the institution twenty-one years ago has devoted to its service his financial means and a truly intense interest in its aims and methods.

During the past month, the Directors of the Association have voted unanimously that in view of the great services and sacrifices in the interests of the Canadian Forestry Association which have distinguished Mr. Little's career, special provision be made in respect to him so that his name may be retained at the head of the list of past presidents who are, ex officio, directors of the Association.

Where Our Waste Paper Goes

By G. Gerald Blyth.

Many readers may have wondered where the waste paper they donated to some charitable organization or sold to the rag-picker went, and how it was finally converted once more into a new commodity. Every year a very large quantity of waste paper is made over into cardboard of various thicknesses, qualities and colors. In 1919, 64,078 tons of waste paper were used chiefly for this purpose in the pulp and paper mills of Canada, having a total value of $1,782,070.

Cardboard is made up of a "filler" and a "liner." The "filler" is the centre stratum of the finished product, and it is in the making of the "filler" that waste paper of all descriptions is employed.

In the cardboard mills of J. R. Booth, Ottawa, the average daily consumption of waste paper for the manufacture of "fillers" is in the neighborhood of 40 tons.

The outside strata are known as the "liners," and a mixture of sulphite and ground wood in varying proportions is used in their manufacture. For heavy cardboard of high grade, approximately 30% sulphite is added to 70% ground wood. The addition of sulphite gives strength and pliability to the product as the sulphite fibre is longer and less brittle. No waste paper is used in the manufacture of the "liners."

There is a very steady demand for clean waste paper—that is, paper free from foreign substances. In spite of this constant demand for waste paper with our usual prodigality, a very large amount of old or waste paper is needlessly burned or otherwise destroyed every year when it might be put to valuable service once more.

Vancouver, British Columbia.—Twenty-five thousand dollars has been loaned to the Douglas Fir Turpentine Company by the provincial government, as an aid to establishment. The company, which will engage in the extraction of turpentine from the Douglas fir, has a plant in operation on False Creek, and has completed extensive and successful experiments in tapping the trees.

ANOTHER CHAPTER ON "THE LOST BALLOONISTS."

The picture reproduced herewith shows the three Ontario fire rangers who made a record trip over the frozen Missinabi River at night when they brought the news of the American trio, Lieutenants Kloor, Farrow and Hinton. The rangers' journey covered 55 miles and was made without a stop in one day on snow shoes. From left to right the figures are:—B. Roney, Chief Ranger, W. R. Clark and Earl Trousse. These men have made a reputation for their speed on snow shoes through the North Country. The two dogs used on the journey are regarded as the best sled dogs in the district.

Relation of Foresters to the Logging Department

By B. F. Avery, Forester, Spanish River Pulp and Paper Mills, Ltd.

THERE is no doubt but that every forester has decided views regarding the relationship of foresters to logging operations. Although all foresters may see eye to eye with respect to the aims of the profession of forestry, variation in conditions under which each is practising as well as variations in the character of the individual, has resulted and will result in varied conceptions of the means by which the aim is to be realized. No one can lay down a set of rules for all to follow saying "Do this and your desire shall be fulfilled." The conditions under which we are all working are so different that the relationship of each to the woods operations must also differ. The complexity of the element of personnel is sufficiently evident to impress us with this fact.

We may, however, through an interchange of ideas upon this subject evolve certain principles which will serve to guide us all in the formation of our working policies.

The Aim of Foresters.

Let us start from a point upon which we are all agreed, the aim of the practice of forestry. Briefly expressed, it is the continuous production of merchantable woods products upon all land chiefly valuable for growing trees. To obtain this end two courses of endeavor are apparent. One leads towards research, the establishment of certain silvicultural truths. The other toward industrial practice, the application of the established truth to a given forest problem. The members of one group, free from the trammels of commercialism, carry on purely scientific work. Members of the other group spend their efforts in making the practice of forestry pay in industry. The distinction between the two groups is definite. It has been through confusion of the two in minds of foresters themselves as well as in the minds of the public that has made the foresters' path so difficult.

In a regrettable number of cases where foresters are employed by wood-using industries the relationship between the foresters and the logging operations is like that between the Rocky Mountains and a mule, there may be contact but no relationship. True relationship must be based upon interdependence, when the aims of both are one and each is dependent upon the other for the attainment of the common end there is a basis for an ideal relationship. At this point foresters cease to see eye to eye. Each one has his opinion of the ideal relationship that ought to exist, and, backed by the condition he knows, his opinion is doubtless sound.

But I believe we can agree on yet another point. When the chief of logging operations and the forester are the same person, the conditions for the practice of forestry are ideal. The conditions are ideal, for, in shouldering the responsibility of the operator to furnish the required supply of raw material to the plant annually, he will practise those principles of continuous production, and only those, that he is able to practise without increasing his present costs prohibitively. He will do that which we are all desirous of doing, practise as much of ideal forestry as the economic conditions and the financial position of his company allows.

Personal Relationships.

In the absence of such a situation, i.e., that of a forester in charge of woods operation, there may exist any of a great variety of situations. But whatever the relationship between the logging department and the forester should be, it is what the policy of the company permits it to be. Personal enmity between individuals is often a means of preventing the establishment of a proper relationship, even when a comprehensive policy in regard to the handling of woodlands has been expressed. The factor of personal enmity is entirely outside of the scope of this paper, but I mention it because, when all other conditions for co-operation are favorable, this factor may cause failure. Progress in forestry practice cannot be made until the trouble has been eradicated.

For a moment let us consider the aim of logging departments in order to ascertain how that aim differs from the aim of the profession of forestry, and therefore of the forester. The woods department, or logging department, is established in order to cut and deliver to a wood-using plant, sufficient raw material to supply the annual needs of that plant. The aim of the logging department, then, is the cutting and delivery of sufficient wood each year (at a minimum cost), to supply the annual demands of the plant for which that department exists. The logging department is the "harvester." It is not anything else. It was established for no other purpose. But, if we add the word "continuously" after the word "plant," so that the aim reads thus—"The cutting and delivery of

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Presented at meeting of Canadian Society of Forest Engineers, Montreal, Jan. 18, 1921.

sufficient wood each year (at a minimum cost) to supply the annual demands of the plant continuously," we have an aim that a forester may accept as a basis for a constructive policy of woods management. There are companies which have expressed such a policy. Under this condition the forester and the logging department are interdependent, and there is established a basis for the proper relationship.

There exist wood-using industries that cry continually for a constant supply of raw material. They may, and generally do have a forester employed, but their policy of management does not include the principles which permit the forester to practise the fundamentals of continuous yield. They insinuate, if they do not state definitely, that the forester cannot solve the problem of a future wood supply, and turning their backs to the solution, continue to cry for wood. The best hope of the forester in such a position is the example of companies, which, by a comprehensive policy, have made it possible for forestry to be practised upon their limits. By means of such examples, he may succeed in establishing relationship as well as contact with his logging department.

The Appetite For Logs.

We must remember, at all times, that present needs are paramount in industry. In a properly administered industry preparation is made for future contingencies, but, without present operation, the industry has no future. The logging department fulfills a present need. It harvests and delivers the raw material that supplies the plant. In the case of an established mill, it is present when the forester comes. Forestry includes logging operations within its scope. In fact to the industrial forester, logging is the "sine qua non" of forestry practice. Since this is true, why should not the forester be put in charge of the woods department? The answer is obvious. Few foresters have sufficient knowledge and experience in actual operations to successfully manage the work without a certain period spent in the study of existing local conditions. If he is not capable of management at once, what is his position to be? How is he to function?

Let us assume a case. The management of the company has incorporated in its policy the principle of continuous yield from its timber limits. There must be centralized control of the woods department. If the forester is not fitted, or is not allowed to manage the woods department, he must come in under the jurisdiction of the man who is the head of the department. The management, it has been assumed, has expressed the desire to establish continuous production upon the limits of the company. The forester has been employed to assist the management in carrying out this policy. It is the function of the forester to study conditions, and, based upon observations, judgement, and the truth established by the research group, submit to his chief, means by which the desired result may be obtained. If the forester uses judgment, and the management is sincere, the progress toward the ideal will be continuous. It will not be revolutionary, but it will be continuous. The management, as the meeting point of logging department and forester, receives suggestions from the forester and puts the suggestions into practice through the logging operation. In the eye of the management, the forester is an instrument, as the logging department is an instrument in the carrying out of his policy. In the eye of the logging department, the forester is a partner, loyal to the same head, and a potential guarantee of the extended life of the operation. In the eye of the forester, the logging department is a co-worker in the industry and the direct means of carrying out one of the three steps in his forestry practice.

By mutual consideration for the problems of the other man; by constant personal contact between the members of the logging department and the forester, there will exist a relationship that cannot fail to bring progress in woods management and to hasten the fulfillment of the aim of the profession of forestry.

Mr. H. R. Christie (M.C.), formerly Assistant Chief Forester of British Columbia, who has accepted the important post of Dean of the Forest School of the University of British Columbia. Mr. Christie's high qualifications are recognized by all Canadian foresters.

Old Giants Windthrown

Port Angels, Wash.—Timber valued at nearly $100,000,000 was uprooted in a storm which swept the Olympic Peninsula of Washington between January 20 and 30, Charles Morganroth, assistant federal forest supervisor estimates sixty per cent. of the timber can be salvaged with prompt action, Mr. Morganroth said. He added that some of the trees destroyed were standing 500 years before Columbus discovered America.

Fredericton, N.B.—Estimates received from scalers reaching the Department of Lands and Mines indicate a cut of approximately 200,000,000 feet of lumber upon the crown lands of New Brunswick this year. Last year the cut of lumber upon New Brunswick's Crown lands was about 360,000,000 feet.

"Forestry for the Private Owner."

This is the title of a most interesting and helpful book just issued by the New York State College of Forestry and bearing the authorship of Professor F. F. Moon and Professor Harold C. Belyea.

The town of Iroquois Falls, Ontario, is the home of the Abitibi Power and Paper Company. A few years ago, the area now dominated by huge mills and beautifully arranged streets of residences was part of the dreary wilderness of forest and river. To-day from the single square mile now occupied by the municipality, there is a wage distribution of close to four million dollars a year.

Such is the typical service of the Canadian forest. The story of Iroquois Falls lends force to the reiterated argument of the Canadian Forestry Association's propaganda that "a live forest means live jobs; dead forests drive out population."

The Lesson Driven Home.

If any reader doubts the extent of deforestation in the eastern United States, consider the situation of New York and Pennsylvania, formerly exporters of timber which to-day import 80 to 90% of the timber they use. Certain other states of the American Union import 97% of domestic timber requirements.

FOREST PROTECTION OPERATIONS IN THE AIR.

A flying boat of the Dominion Air Board ready to be launched at its base on Mara Lake, Sicamous, B.C.

The Common Problem

By R. S. Kellogg

Sec. Newsprint Service Bureau, N.Y.

REGARDLESS of necessary differences in local conditions and political organization, the fundamental features of the forestry problem are alike on both sides of the International Boundary. The pulp and paper industry of North America is conspicuously an international industry with an interlocking financial basis and largely common markets. There are also many other undertakings in which citizens of the United States and Canada are mutually interested.

In some respects, Canadian forest policies, because more recent, have heretofore been more far-sighted than those of the United States. In other respects, possibly the movement in the United States has gone further than it has in Canada. In neither country has the problem yet been tackled in the thorough-going fashion it must be, in order that our great industries and the very life of the people may be sustained in the future upon the basis on which they have been organized and built up.

Foresters have every reason to think that the year 1921 will be the best year they have yet seen for the widespread acceptance of the gospel they have been preaching for many years, and I hazard the prediction that many seeds, which they supposed fell upon stony ground, really lodged in fertile soil and will develop into lusty saplings in the near future.

An Embargo on Pulpwood Export Proposed

MR. Frank J. D. Barnjum, of Annapolis Royal, N.S., has added a new bulletin to the many valuable contributions he has made to the subject of forest conservation along practical lines. It bears the title "An Immediate Export Tax for Embargo on Canada's Fee Land Pulpwood is now Imperative." After detailing the enormous losses of standing timber through the ravages of the budworm in recent years, Mr. Barnjum comes to the conclusion that the simplest way to reckon this loss through forest disease is to assume that one cord per acre on the 75 million acres of timber lands in Quebec has been done away with. In other words, the spruce budworm in the province of Quebec, according to Mr. Barnjum's statement, has caused a depreciation of 75 million cords. The author proceeds to show that the loss from fire has been equally appalling, and quoted a recent estimate that fire damage along just one line of railways, between LaTuque and Cochrane, amounts to 20 million cords, sufficient wood to have kept the paper mills of Quebec running for ten years.

"There is one compensation, poor as it may seem, with relation to our future wood supply, and that is that the money value of what land and wood we still have left has more than doubled on account of the short supply remaining, and this fact we must not forget in considering present prices for pulp, paper, lumber, and wood.

The newspapers are asking for lower prices for paper, while as a matter of fact the manufacturer of paper and lumber is faced with increasing costs in connection with the protection of his forests from fire and bugs, and the only way this can be met is with higher prices. The bud-worm has destroyed such tremendous areas of standing fir and spruce that the fire hazard has been increased a hundred fold owing to the very large areas of dry dead trees in the woods, entailing a greatly increased fire patrol.

Higher prices for land, pulpwood,

lumber, and paper is the only practical conservation that I can see, as it will have the effect of preventing waste in these commodities and will enable the land owner to set aside something to spend for increased fire protection burning of slash, selective cutting, and reforestation.

The time is now here when a careful burning of slash and debris must be practised as a measure of protection against insect pests and also as a fire preventive measure.

When timberlands in the East attain a value of $50 per acre, which is less than one-half of what it will cost to reproduce, then and only then will there probably be some check in the enormous waste that is going on in the woods in connection with logging operations.

When paper, which has the distinction of being manufactured from the most rapidly disappearing raw material of any of our manufactured products, attains a price commensurate with its real value, which before this product was manufactured out of wood was about twenty cents per pound, then and probably not till then will the present enormous waste in paper be curtailed.

The Public Stands the Cost.

It matters not to the publishers what the price of paper is, so long as they all pay practically the same, as the cost will simply be passed along to the consumer in any event. The interests of the newspaper publishers and the newsprint manufacturers are one, as they are both dependent on the conservation of our forests.

If this partial picture of destruction is not sufficient to cause our Government to put a heavy export tax or embargo on our fee land wood, then the complete story will have to be told.

In the past the only argument against this procedure has been that it would be a hardship to the farmer or fee land owner, as it would prevent him from obtaining the best price for his wood; but this does not apply now, for with Canada's more than one hundred pulp and paper mills, and more building, the home market, with its shorter rail haul makes the more durable market, both for the wood as well as for farm produce. With the enormous loss of wood that our mills have suffered we can now afford to pay just as much for wood as the mills of the United States. As a matter of fact wood is selling in Quebec as high as it is in Maine. The home market for our farm produce has now also become more important than ever, on account of the customs duties which the United States is piling up against us.

How Business Will Gain.

Every mill erected in Canada means another town and just so much more demand for the product of the farm as well as more freight for our railroads, as every car of wood hauled to a paper mill means four additional cars of other material and supplies, which would increase the income of our railroads enormously. It would mean the haulage of five hundred thousand additional carloads of freight if the million and a quarter cords of fee land wood now exported to the States was manufactured in Canada."

In addition to all of the above facts, the item of the difference in exchange is a very important one. When we ship out a cord of wood, there is only a matter of twenty-five dollars left in Canada, while if this cord of wood is manufactured into paper it would leave with us nearly three times as much, or seventy-five dollars. In other words the million and a quarter cords of wood we shipped out last year left in this country only a matter of thirty-two million dollars, and I am afraid much less. If manufactured into paper this would have enriched Canada to the extent of approximately one hundred million dollars. This means that we have suffered a direct loss of more than seventy million dollars, while the indirect loss has probably been much more. This would reduce our trade balance to a very material extent.

Courtesy Western Lumberman.
A flying boat of the Dominion Air Board making a landing at Shuswap Lake, near Sicamous, British Columbia.

Possibly even more important still especially in times of unemployment like the present, the additional annual employment of the ten thousand men necessary to turn this million and a quarter cords of wood into paper would mean a city of fifty thousand people, or twenty-five new towns of two thousand population each; although, with the enormous expansion we have had and are now having in the pulp and paper industry, we have but a very short supply for many of our present mills and Canada is already over-developed in so far as pulp and paper are concerned. At least some measure of protection must be afforded to mills already built.

No country, no matter how friendly its relations may be, will consent to the closing of one of its own most important industries for the sake of supplying raw material to the mills of another country.

This time has now arrived. With the tremendous loss in our available wood supply it is now no longer a question for international negotiations, but it is simply a question of life or death for our pulp and paper industry.

The Management of Pulp Lands in Eastern Canada

By E. F. McCarthy
Forest Research Specialist, Commission of Conservation

THE time has arrived when cut-over pulpwood lands have a recognized potential value. This fact is so obvious that it has given rise to inquiry by the owners of such land as to the best method of handling for a second cutting. I would suggest to the owner of these lands as the first step, that he should put his land holdings on the same business basis as he now considers his mills and logging operations. If then the owner considers his capital as invested for a period of years only and does not look to the future to yield him continuous crops of timber, I would further advise that he be sure in discarding cut-over land that he is not throwing away a growing asset.

Since proximity to manufacturing centers is a prominent factor in the woods business and the accessible supply of wild forest is a known and acute element to many established operators, the operator should make intelligent inquiry into the character and value of his cut-over lands, put the whole mass of facts on a simple balance sheet and decide whether his business can proceed continuously on his present holdings or whether, if unable to add to these holdings, he must face a cessation of that business after a period of years.

There is no secret formula for the recreation of our forest resources, and if it were possible to prescribe to-day a simple method which would cover Canada with a growing forest, the state would profit but the individual would not. It is a fact known to all of us that large profits have been made for the fortunate few who have possessed timber when the general supply has waned. The truth about forest conditions will inflict the same penalty or reward on one operator as on another and success will be achieved by business insight operating in the light of complete information as to assets and liabilities.

The First Inquiry.

The first step, therefore, is a careful inquiry into the character of timber land holdings. This must be made for the individual tract. Growth in the forests of white spruce will vary from that in the red and black spruce mixtures. The mixture of tolerant hardwoods with the most desirable softwoods creates a different and more difficult problem than that presented in mixtures of softwood with aspen and paper birch. Climate, soil, insects and disease, fire risk, proximity to market and even social conditions are all dominant factors in the establishment of a forest business, and any one may cause the success or failure of the enterprise.

Many of these are easily calculated and in others, causes and effects are unknown. We are rather too prone to ask why the forest fails or succeeds rather than to limit ourselves to the simple determination of how a specific area of forest will act when cut over. Cut-over land is a mystery to many of us, and even more so to the average operator who never sees it close up after the timber crop has been removed, and if he does find cause to traverse cut-over land, sees a given area but once, and because he has not a mental picture of its original condition he has no measure by which to judge what has taken place there.

Casual observation from a train, an automobile or even a travelled tote road gives a poor average impression of the general character of cut-over land, because along these roads conditions have been established which are usually different from the average character of the logged area. Cut-over land must be investigated intelligently and systematically at the expense of considerable effort and much torn clothing, if the history of the area is to be thoroughly understood. A study carefully made, systematically covering logged-over land by some well known method such as our strip method, can be made to yield accurate information of the following character and extent:

Exact Information Needed.

(1) The live growing capital stock of timber, young advanced growth and reproduction.

(2) The loss of capital stock by cutting.

(3) The loss of capital stock by wind and other natural agencies.

(4) The net volume increment since the cutting and probable net increment for the immediate future.

(5) The fire risk and natural conditions controlling it.

(6) The period of years to the next cut and amount of that next cut.

(7) The acreage that is productive and that which is not, thereby allowing for adjustment.

In addition this study will show what material now exists on the land, which is not now of value to the industry, but has potential value for other purposes; this constitutes the by-product of the industry and calls for market development.

The other important but less certain yield of a study of this kind is an intimate knowledge of the forest through which alone the laws that control its composition and life can be learned. By such means we will eventually be able to produce the forest we want to grow in place of the forest which the present natural agencies will produce. Forest improvement is the second step and cannot wisely be made to take precedence without allowing first for inquiry as to what is the gift of nature.

I have prefaced the description of the subject assigned me in this manner to emphasize the importance of placing timber land management upon a sound business basis. At the same time, I feel that it was expected in the assignment that the problem would be taken up in its details, consequently I shall present to you facts which I have come to believe concerning the various types of forests in eastern Canada.

Softwood Types.

Spruce and balsam can, in most instances, be cut by a selection system without jeopardizing the dominance or succession of softwoods. This is especially true where the trees are not subject to heavy windfall or other calamity and where the stand has a good representation of all size classes. It is not true where the timber is uniform in size, has reached a mature age and is growing slowly because of its density, for any disturbance will result in heavy mortality. Such stands are found on swamp lands and in rare instances on moist flat lands. The heavy mortality of medium seized classes makes it advisable to cut such dense stands to as low a size as is commercially feasible. This will not result in clear cut in the true sense of the word, but will leave a very considerable stand of trees below 5 inches in diameter. To carry on the growth, reproduction on the moist soil will add considerably to the stand immediately follow-

Interesting views taken during a trip through the Mississaga Forest Reserve of Ontario by K. S. Clarke of Coniston, Ontario. "Some of the shores were burned many years ago, but other parts have beautiful stands of white and red pine and large spruce," writes Mr. Clarke to the Forestry Magazine.

ing the cutting. In all softwood stands there is usually enough moisture in the soil to produce a crop of seedlings following the logging operation, but if the soil is covered by a heavy humus and the cutting is heavy, the reproduction will not succeed because of excessive drying out of this humus soil cover. Furthermore, if the stand has not been dense enough to keep out the undergrowth of wood shrubs, the success of the second crop will be impaired by the shade of the resultant mat of released shrubbery.

Controlling the Brush.

In any case the immediate success of cut-over spruce and balsam lands is dependent on the number, size and distribution of the advance growth, which will produce the next and probably the second cut. One fire will destroy advance growth and retard production for an extended period of years or destroy it altogether. It is on softwood lands that fire is most prevalent and hardest to control. Another fact influencing the advanced growth and reproduction is the matting of brush left following logging operations. In dense stands this is very heavy, and must be controlled to prevent the covering up and killing of existing young trees and prevention of seeding. The method of slash disposal will be determined by local logging conditions, the density of the brush and danger of fire. In light stands it may be possible to scatter the brush in such a manner that no danger will be done to young growing trees.

The rate of growth on cut-over land of the white spruce and balsam type is quite remarkable when protected from fire. A study of such type was made by the Commission of Conservation during the past year on limits of the Spanish River Pulp and Paper Mills, Limited, and shows diameter growth at an average rate of one inch in five years for white spruce and balsam. It can be readily seen that the actual volume increment per acre is dependent on the number and size of such trees per acre. We have been lax in impressing the fact upon timber land owners that volume production is not a question of investment of soil capital alone, but also of wood capital up to the point of loss of growth by crowding.

I have emphazised the use of a selection system as being most feasible at this time, and want to object to confusion of that with the use of a diameter limit regulation which is selection done with the eyes shut. However needful it may have been in the past, it can be improved by the introduction of trained human judgment.

On the whole, the outlook for future production of timber on spruce and balsam lands is hopeful in so far as there is a good representation of the lower diameter classes and ample advanced growth, if this growth is protected in cutting and protected from fire.

Paper Birch-Softwood Mixture.

There is another type composed of a mixture of paper birch and aspen with spruce and balsam which may be treated much as the pure softwood type of pulp species, though the rate of growth will be reduced somewhat by the shade of the birch and aspen where the overhead stand is dense. The younger the stand, the greater the chance of successful management. There may be a confident outlook toward early utilization of these hardwoods which will bring about an increase in the percentage of softwoods in the stand. The acreage of this type is large and its management will not be difficult.

The Tolerant Hardwoods.

Beech, the two species of maple and yellow birch, complicate the present management of the mixed type of Eastern Canada. Their presence is due to the following characteristics more or less common to the four:

(1) Ability to endure shade.

(2) Large crops of seed, annually, very motile in all except the beech and able to take root through hardwood leaf litter.

(3) Fast growth in early life. (Twice as fast in height as the red spruce from one to ten feet high.)

(4) Long life and ability to recover.

(5) Spreading crowns.

(6) Greater present value of the softwoods and difficulty in logging and transportation of hardwoods.

(7) Ability of hardwoods to sprout.

(8) A hardwood leaf crop which prohibits softwood seeding.

(9) Preference of hardwoods for the better sites.

Keeping in mind these advantages which the hardwoods possess in competition for space in the mixed forest type, we must not expect that the cutting of softwoods in any way, while the hardwoods are left intact, will result in an increase of percentage of softwood in the stand. It is now possible to find in the eastern portion of the northern forests, where this type is prominent, areas that have been cut in almost every conceivable way and in none of them is there any sign of success in the elimination of hardwood competition. In diameter limit cuts where softwood alone is removed, a second cut of softwood has been obtained with very slow growth during the period elapsing between the two cuts, while the latter effect of cutting the large-crowned hardwoods is merely delayed.

The operator must expect, therefore, to face the logging of hardwoods from these lands and in many places can now do it at a profit. Where hardwoods have thus been removed, it is found that a complete growth of young hardwood seedlings is established which quickly overshadows the advance growth and seedlings so that the operator is thus not only faced with the removal of the virgin stand but also with the removal in the future of the pole stand of hardwoods established following his first logging operation.

It is my belief that where it is possible to remove the hardwoods and retain as large a percentage of softwoods as can be retained without serious loss by breakage in logging or by windfall, there will be established, along with the second growth hardwood, a considerable stand of softwood. This young growth of softwood can then be fostered in the later cutting of the hardwood second growth and will doubtless lead to an improvement of the softwood percentage in the stand. This. however, involves practices which are not now economically feasible.

Jack Pine Lands.

We may look forward hopefully to the possibility of the utilization of jack pine for pulp purposes, and we are especially favoured by the ease with which it regenerates on cut-over land where there have been light fires. It will be necessary, however, to carefully preserve the first crop of seedlings since a second will not be available after the destruction of the seed trees and seed in the soil. Very little regulation except proper protection of young trees will probably be needed in the management of this type.

Hardwood Ridges.

The ridges of pure maple, which are found throughout portions of Eastern Canada, have a certain value as barriers against fire, but offer nothing to the pulp operator since conversion from the pure hardwood stand to a softwood stand involves nothing short of clean cutting, burning and planting.

Burned Lands.

There are numerous areas of small acreage throughout Canada which have been burned while the virgin stand remained about them and now have throughout, young pole stands of paper birch and aspen. I feel confident that there will be a market for these stands of timber and the fact that spruce and balsam, and in some cases white pine, are coming in plentifully, points hopefully to the reclamation of these small areas.

This summarizes the prevailing types of forest lands in Eastern Canada and such advice as I have to offer concerning their management. I want to emphasize that each area has its own particular problems which can be covered by no general rules and that the first essential to management is an accurate stocktaking of the area involved; that there are more possibilities in the protection of the young timber standing on the ground than we have previously believed, and that the protection of this from fire must be recognized as a vital element in Canada's future forest policy.

Western Lumbermen on Right Track

THE Western Retail Lumbermen's Association, of which Mr. Theodore A. Sparks is President, Mr. R. Skov, Vice-President, and Mr. Fred. Lamar, Secretary (until his recent resignation to enter business), is generally regarded as one of the most wideawake and progressive bodies in the Dominion. On forestry matters the western retail lumbermen can be relied upon for a maximum of intelligent action. At the recent annual convention an important resolution was unanimously passed expressing strong convictions upon forest conservation.

It read as follows:

WHEREAS the Statistical Branch of the Forestry Department shows that nearly two-thirds of the total forest area of Canada has been destroyed through various sources during the past seventy-five years, and that at the present rate of consumption the forest supply of the Prairie Provinces will be depleted in twenty-five years, and that of Canada in fifty years, unless further means are taken to protect our forests, with its serious result not only from a lumber standpoint, but also from the standpoint of the loss to the country, through the protection afforded to the source of moisture by the present forest area.

BE IT THEREFORE RESOLVED THAT, the Western Retail Lumbermen's Association realize that Reforestation, and the greatest possible protection of our present forests is absolutely necessary if the lumber industry is to continue on the present large scale:

THAT, Forest protection is a matter of vital interest, not only to the lumbermen, but to every citizen of Canada:

We, therefore, place ourselves on record as fully sympathizing with, and supporting the work of Forestry in Canada, and are of the opinion that the work of the Forest Service in Canada should be greatly extended, particularly in the case of FIRE PREVENTION:

THAT, the present staff of the FIRE RANGING SERVICE BE LARGELY INCREASD, and that the Service be equipped with every modern appliance for Forest Fire fighting, in order that our Forests will be given the maximum protection:

THAT, Provincial Fire Prevention Laws be made more severe, and that they be rigidly enforced:

THAT greater efforts be made in educating the public to fully realize the enormous damage caused by FIRE, and demanding their assistance in its Prevention, and that the Members of this Association personally assist in arousing the public Interest:

THAT, copies of this resolution be forwarded to the Western Premiers, the Minister of the Interior, the Director of Forestry, the Secretary of the Canadian Forestry Association, and to the Press.

The Distillation of Wood

By Dr. Alfred E. Macintyre, Ottawa

(Article No. 3)

THE ultimate yield of the prime products obtained by the distillation of wood depends upon the quantity of the respective substances produced by the carbonization of the raw material in the retort. This operation is most important, as a low yield of acid and alcohol in the retorting process means a corresponding output of the prime products. It is therefore necessary that the carbonization in the retort be conducted in as scientific a manner as possible. The operation should not be carried out by "rule of thumb" methods, but with every degree of precaution and control, in order that a maximum yield of the crude products be obtained. Therefore the carbonization of wood should be controlled by persons familiar with the conditions which must be applied to attain the greatest quantity of valuable commercial products.

As a rule there is no scientific control in any part of the Canadian factories producing the prime products—acetate of lime and methyl alcohol. The operations are generally in charge of men who apply empirical methods based upon "rule of thumb" observations, and as will be observed later, these are often productive of low yields of both acid and alcohol.

Carbonization of the Wood

The following is a short description of the process employed for obtaining acetate of lime, wood alcohol and charcoal. The wood is introduced into the hot retort and the doors sealed. The first phase of the pyrolytic distillation is the conversion of the natural moisture of the wood into aqueous vapor and latter's condensation into water in the condenser. There is very little decomposition of the wood under 300° F., which is reached after four hours' firing. When the temperature in the retort approaches 340° F., a yellowish aqueous liquor containing acid commences to flow from the condenser, and the quantitative volume rapidly increases during the next four hours. If proper control has been maintained in heating the retort, the temperature, at this stage, should be 485° F., and there should be a strong flow of pyroligneous acid having isolated reddish-brown spots and streaks. The wood within the retort has undergone a change, and a certain portion of it, particularly the exterior layers, has been converted into charcoal of a dark walnut colour.

After about ten hours' heating, the so-called critical temperature, or exothermic point, is reached. The liquor flowing from the condenser has a decided reddish color, due to the so-called soluble oils and tars, and, at this stage, great care has to be exercised in applying heat to the retort. The exothermic point lies at 515-535 °F. The temperature for the next two or three hours should be maintained between 515-555 °F.

The maximum flow of crude liquor is reached after twelve hours, and the pyroligneous acid is dark red in colour, caused by the presence of thin tar. From the fifteenth hour, there is a steady decline in the flow of liquor, and it is of a viscid tarry character. The greater portion of the wood in the retort is converted into charcoal after seventeen hours proper firing, and the temperature of the exit gases, from the retort, is between 575-675 °F. The flow of tarry liquor is very small at the twentieth hour, and the temperature is about 575 °F. All the volatile condensable constituents of the wood pass over before the twenty-fourth hour. The carbonization is complete, and the charcoal drawn out and placed in the coolers, and these sealed.

Uncondensable gas begins to form when the temperature is about 325 °F., and the flow is most pronounced at the exothermic point, 515-535 °F. If the firing and temperature is not controlled at this stage, the quantity of gas may become excessive, due, in part, to the partial decomposition of the acid and alcohol vapours in the retort, resulting in a considerable loss, with the production of increased quantities of oil in the crude liquor. The gas is employed for heating the retort or under the boiler.

The quantity of crude pyroligneous acid produced will vary according to the species of wood employed, the percentage of moisture which it contained, and the conditions adopted in the carbonization.

Purification of Acid Liquor

The acid liquor passes from the condenser to the settling tanks, where the specifically heavier tar separates to the bottom. The acid liquor from the tanks is purified by being distilled from a copper still, heated by indirect steam, and the associated tar remains behind. The tars are freed of acid and volatile oils by distilation, with steam, in the tar still. The distillates from the stills pass to their respective settling tanks where the oils separate out at the top and bottom, according to density, while the acid liquor lies between. The latter is run into the liming tank, and neutralised with lime, the acid being converted into an aqueous solution of acetate of lime associated with other volatile constituents. The quantity of lime necessary to neutralize the acid is generally determined when the addition produces a permanent port wine colour. This coloration is due to the presence, in the distilled liquor, of a compound formed in small quantity during the carbonization process. It is probable that the substance is a methyl ether of pyrogallol, and the reaction due to traces of iron present in the lime employed.

The "Lime Lee" Still

The neutralised liquor is distilled in what is termed the "lime lee" still. A volatile aqueous mixture of crude methyl alcohol, acetone, oils, etc., distils over, while a portion of the aldehydic constituents is resinified, and methyl acetate present hydrolysed. The distillate passes to the crude alcohol tank to settle, and the hot aqueous acetate of lime is run off through filter bags into the evaporating apparatus. The solution is evaporated until the acetate crystallizes out as a thick mush, which contains 40-50 per cent. water, and is then placed upon the drying floors and dried. The gray acetate produced contains from 80-84 per cent. of anhydrous lime compounds of organic acids, principally acetic, the latter being associated with small quantities of propionic, butyric, etc., acids as lime compounds. The other substances present in the acetate are moisture, water of crystallisation and a small percentage of impurities. Acetate of lime is principally employed for making acetic acid and its derivatives, and acetone.

Wood Alcohol

The crude wood alcohol distillate, from the "lime lee" still, upon standing, divides into three layers—heavy oils, crude alcohol and light oils. The crude alcohol is rectified in a fractionating still similar to those used in alcohol distilleries. The wood alcohol is obtained as 95 per cent. spirit and shipped (in tank cars) to the refinery for further purification to free it from acetone, oils and other impurities. It is sold under different names for various purposes, and employed for the making of methylated spirits and formaldehyde.

The oils, which separate in the settling tanks for the purified acid, tar and crude alcohol distillates, are divided into light, heavy and acid oils, and were formerly employed as fuel at the factories. These are generally termed creosote oils. The tar which, except the charcoal, is the principal quantitive product derived from the carbonization of the wood, is burned as fuel under the retort or boiler.

There are a number of processes for the carbonization of wood and purification of the crude products, but it is the intention to touch upon one, which is of interest on account of economy of fuel and apparatus.

Meyer, of Hannover, introduced a method by which the distillation of the crude liquor is eliminated. This is done by bubbling the hot gases, as they leave the retort, through layers of hot tars, by which the tar of the pyroligneous acid is removed and the distillate obtained ready for neutralization. This saves the crude acid settling tanks, acid still, condenser and fuel necessary for distillation. The pressure of the tar upon the bubbles of gas is proportional to the height of the tar above the initial gas bubble and the specific gravity of the tar, therefore this method causes a back pressure upon the retort. To overcome this difficulty suction fans have been introduced into the system, but, notwithstanding this, the result is not perfectly satisfactory. From a chemical viewpoint the passage of the gases, at a high temperature, through the hot aromatic tars is not desirable, owing to the possibility of interaction between the volatile gases and certain constituents of the tars.

Yield of Products

Statistical returns in America are generally based upon the yield per cord of wood. The cord is not a constant in all parts of this continent, and varies a great deal, and is therefore an unsatisfactory basis for the calculation of comparative yields. Generally speaking a cord of air-dried wood weighs about 3,800-4,000 lbs., and contains, variable percentages of moisture. In order to obtain comparative figures regarding the yields of the various substances all the data employed have been recalculated to the basis of 4,000 pounds of absolutely dry wood. The statistics are based upon actual production in certain factories, unless otherwise specified, and those for Canada taken from statements of the principal manufacturers.

Table Showing Yield of Products

Acetate of Lime—	European factory	307.5	lbs.
,,	Laboratory experimental retort	351.7	,,
,,	Canadian factory	250.0	,,
Wood Alcohol—	European factory	10.0	gals.
,,	Commercial experimental, controlled	11.6	,,
,,	Laboratory experimental retort	11.96	,,
,,	Canadian factory	10.00	,,
Charcoal—	European factory	14.20	lbs.
,,	Commercial experiment, controlled	14.75	,,
,,	Canadian factory	12.50	,,

The tar varies between 18-30 gals. according to the species of wood and process of carbonization and the oils from 1.5-4.0 gals.

In the concluding communication some attention will be given the above data and possibilities of improving the wood distillation industries, with a short account of the European practice of distilling soft woods.

"The University in Overalls."

The Canadian Forestry Magazine is in receipt of a most readable book published by the Ryerson Press, Toronto, at two dollars. The title, "The University in Overalls," happily characterizes a narrative of human reclamation in the lumber, mining and railway camps of the Dominion. The author, Rev. Alfred Fitzpatrick, in 1900, founded the Reading Camp Association, which grew into the Frontier College, an institution which almost unaided and all too meagrely encouraged by the orthodox bodies, has reached out a helping hand to the handicapped Canadian worker at the frontier posts of civilization. It has been a splendid work all through. Mr. Fitzpatrick in his very interesting book does not hesitate to criticize a system of education which provides the maximum of advantages for the fortunate few in the great centres and wholly abandons the tens of thousands working in the wilderness. The reader cannot fail to see the force of the argument that where masses of uneducated men crammed together in poor quarters are denied healthful companionship and ennobling incentives, moral and physical degradation may be looked for as the common dividends. Perhaps in all the talk of conserving the natural resources, we are rather too apt to neglect the warning of Emerson: "I would not have the laborer sacrificed to the result. Let there be worse cotton and better men."

Mr. Edward W. Conners, of the James W. Sewall forest engineering office, Old Town, Maine, and Washington, D.C., is in New York and Boston making calls on land owners and operators in the interests of the Sewall organization. Mr. Conners reports that general sentiment is optimistic for the future in both pulpwood and lumber, although present conditions are quiet. Another of Mr. Sewall's men who recently returned from an extended trip through the south reports much the same quiet confidence in a coming well-sustained business.

Victoria, British Columbia.—An added impetus to the clearing of land by settlers is contained in the announcement that a stump using industry is to be established in the province. Small portable mills are being sent to various districts which cut up the stumps, securing on an average 200 slabs an inch thick from each root. The wood takes a good polish and will be used for chairs and other furniture. As much as $1,800 has been obtained for a sliced stump.

Heavy Enrolment of Students.

The enrolment of students in the Faculty of Forestry at the University of Toronto this year exceeded by a small margin the previous records. Fifty-four students were enrolled: the highest previous record was in 1914-15, when fifty-one students were on hand.

PROGRESS IN PAPER COMPANY'S TREE PLANTING

The Spanish River Pulp and Paper Mills, Ltd., ,has established a forest nursery. Seed beds, expected to yield 250,000 plants, were sown in October, 1920. An equal number of beds will be sown in the Spring of 1921 to increase the capacity of the nursery to 500,000 plants. This stock will be ready to plant in the field in the Spring of 1925. Some of the stock may be ready for planting in the Spring of 1924.

Planting will be done on burned-over land where there is no hope of natural regeneration, and on cut over lands where the advance growth of spruce and balsam is not sufficiently dense to produce a second cut.

The Company does not plan to purchase any nursery stock for forest planting. The present nursery will be enlarged to meet the requirements of the present planting plans.

Rt. Hon. Arthur Meighen, Premier of Canada, just before an aerial flight taken at Kamloops, British Columbia, with Major MacLaurin of the Dominion Air Board.

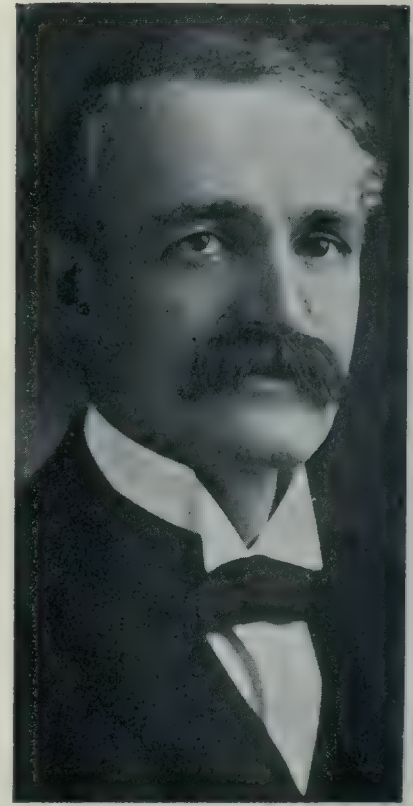
The Economic Significance of Forestry

By Gifford Pinchot, formerly Chief Forester of the United States

IN the matter of our supplies for forest products, we Americans are faced by a set of facts and a problem which, in gravity and far-reaching control over our immediate and remoter future, take their place fairly alongside the issues which centre about the League of Nations. The essential fact is that we are not only destroying our forest supplies far more rapidly than they are being reproduced, but also—what is much more to the point—that we are using up the productive capacity of our forest lands. Not only is there less wood year by year and day by day in the United States, but there is less land growing wood. We are living beyond our income and destroying our invested capital at the same time.

We are nearly bankrupt, and do not know it. Because there has always been wood enough to go round, we have placidly assumed that there always would be. Unfortunately, the facts are against us.

It is true that we have made progress. Forestry in America has come to mean something more than the planting of trees in yards, streets, and schoolgrounds. It is true that we are leaving behind that phase of public opinion which believed that we could somehow compensate for the destruction of the forests on thousands or millions of acres by the planting of trees on tens or hundreds. We hear less of the influence of the forest on climate and health, and more of the need for work. Even the discussion of the effect of the forest in producing rain, and controlling the flow of springs and streams, has been largely replaced by more immediate and practical considerations. Forestry has become a problem to be taken seriously, but as yet its real economic significance is little appreciated and less understood.



GIFFORD PINCHOT

We are coming to realize that wood is the most universal of all materials, that without wood all production would be impossible, transportation a dream, and business dead.

Iron, coal, oil and wood are the four basic materials upon which modern civilization rests, and of these the most widely employed and undoubtedly the most indispensable is wood. So far as wood is concerned, the human race is still very much in the same position it has occupied since before the dawn of recorded history. No need of body or mind can be met, no instant of our lives can be passed in comfort or well being, without something that only the forest can supply. Nothing we eat or use or wear can be produced, transported, or consumed without the help of the forest.

We never could and cannot now get on without it.

This statement is true, nowithstanding the fact that National Forests to the extent of 150 million acres, and State forests to the extent of less than five million, have been set aside and their power to produce has been saved for good. Public forests contain but one-fifth of our timber, and can never be expected to yield much more than one-fifth of our necessary supplies.

Want of Substitutes?

Before proceeding to touch upon the actual situation of our timber and timbered lands, it may be well to say a word about wood substitutes. In the first place, the use of a substitute almost invariably means the employment of a less satisfactory material at a higher price. In the second place, the increase of our population and industry more than keeps pace with the development of substitutes, so that, for example, more wood is used in building construction than when all houses were built of wood, more for shipbuilding than when there were no iron ships. The use of substitutes does not decrease the consumption of wood in any great line of industry.

The essential facts in our forest situation are these: Three-fifths of the timber we once had in the United States is gone. Over two-thirds of our original forest area has been culled, cut-over, or burned. Of our virgin forests, one-sixth remains. Out of about 825 million acres of original forest, we have left to-day less than 140 million acres of virgin timber, about 110 million acres of cull and second growth timber big enough to saw, and about 130 million acres partly stocked with smaller growth. More than eighty million acres have been devastated, and, so far as production is concerned, are practically desert.

Of the merchantable timber yearly cut or destroyed, about three-quarters is taken from the virgin forests which still remain—about one-quarter from second growth. The cut of every class of timber exceeds the growth. Even the young trees too small for the saw are being cut three and one-half times faster than they are being reproduced. Taken together, we are cutting wood of all kinds from our forests more than four times faster than it is being replaced by growth.

The foregoing are official figures presented in reply to a resolution of the Senate by the United States Forest Service on June 1, 1920.

The United States must grow its own timber, or go without. Within a time perilously short in the life of a nation, and well within the active life of men now in affairs, the timber supply of the United States threatens to reach such a point of exhaustion as to compel the abandonment or reorganization of a controlling proportion of our industries, including manufacture, transportation mining and agriculture. The change may be calamitous and substantially complete, unless we can secure from elsewhere the wood absolutely indispensable to our present methods of doing business, and which our own forests will no longer be able to yield.

(To be Continued.)

Laboratories Reorganized.

Important changes have been made through the re-organization of the Forest Products Laboratories of Canada which were established by the Department of the Interior in co-operation with McGill University. The laboratories have suffered from the withdrawal from their technical staff of men attracted by the larger financial remuneration of the pulp and paper industry. A number of new appointments have been made, Mr. William Kynoch being the new superintendent. Chiefs have been found for the three divisions: Timber physics, wood preservation and timber tests and the staff of the latter division has been increased. The branch laboratory at Vancouver has also been reorganized and is continuing the work of testing western woods.

Bark Beetle Combatted

By J. M. Swaine, Entomological Branch, Dominion Department of Agriculture

ABOUT twelve years ago, bark-beetle outbreaks developed in the yellow pine stands of southern British Columbia, particularly in the Similkameen and Nicola districts. The earlier outbreaks have extended and new infestations appeared, until practically the whole yellow pine area shows serious bark-beetle injury. In the valleys about Princeton, more than 150 million feet of yellow pine have been so killed since 1913, and about the same amount in neighboring valleys is threatened with destruction.

The same injury has been developing rapidly since 1918 in heavily timbered valleys lying northwest of Merritt. Judging from our knowledge of the Princeton outbreak, all this timber, estimated to be worth more than six million dollars, is practically certain to be utterly ruined within the next five or six years. This timber was being administered by the Provincial Forest Branch, the Dominion Forestry Branch, the Dominion Department of Indian Affairs and the Nicola Pine Mills, Ltd.

In the winter of 1919-1920, an attempt was made to save this timber through extensive control operations. An arrangement was made whereby the easily available commercial timber in the worst part of the infestation was sold to the lumber company on the understanding that the timber would be cut within two years and the logging slash burned. Much of this commercial timber was cut last winter and the remainder, including the infested trees, will be removed according to this plan. The two forest branches, Provincial and Dominion, provided funds and men for direct control operations on the higher land and in the less accessible valleys where lumbering normally would not be carried on for years.

The planning and supervision of the control methods were undertaken by the Division of Forest Insects, Entomological Branch, Dominion Department of Agriculture, in co-operation with the various interests affected. Control operations consisted in marking, cutting and burning the infested timber so as to destroy the broods of beetles overwintering in the bark and thus prevent further spread of the injury. This work was conducted over many square miles of territory in the Coldwater, Indian Meadows, Midday, and Spius valleys. Altogether more than 6,000 infested trees were cut and burned sufficiently to destroy the bettle broods contained in the bark. The work was done in the late winter and early spring of 1920. The result seems at this date to have been remarkably effective. Whereas there would otherwise have been thousands of freshly infested trees on that area last summer, there are actually only a few hundreds to be found. Without any doubt, a moderate amount of control work on the same area next spring will stop the further spread of the injury, and save the main stand of timber. It is planned to extend the control work to other infested valleys during the coming spring.

The entire Princeton-Merritt-Kamloops forest, throughout the greater part of which the bark beetle injury is evident, has been estimated by the Commission of Conservation to contain more than two billion board feet of yellow pine, which would be worth to the country in manufactured value between twenty and forty millions of dollars. The bark-beetle outbreaks threaten the destruction of the greater part of this timber before it can be used commercially. Control operations such as those just described, together with the burning of pine logging slash, afford our only hope of checking the injury and saving the remaining timber. Fortunately these promise to be effective.

Similar outbreaks occur in western white pine and in lodgepole pine throughout the southern part of the province, but control work in these species has not yet been attempted.

Forest Insects of British Isles

Review of Bulletin No. 2, Survey of Forest Insect Conditions in the British Isles, 1919,
by J. W. Munro, Entomologist to the Forestry Commission.
35 pages, 18 text figures, 3 full page plates and a map.

THIS bulletin has just been received. It gives a very concise and clear account of the important forest insect injuries in the British Isles, and while none of the insect species with which it deals are found in Canada, many of our native species are so closely allied to those of Britain and attack the timber in so similar a way that the results of Mr. Munro's study are of great interest to us.

The bulletin contains 35 pages, and is well illustrated with 18 text figures, 3 plates and one map. The first part deals with the method of inspection, the present forest insect conditions in England, Wales, Scotland and Ireland, biological considerations, and forest practice in relation to insect attacks; the second part, or appendix, gives a short account of the more destructive forest insect species of Britain, together with a statement of their habits, the injury they cause, and the suggested methods for control.

In the summary of the general conditions it is stated that, "The preliminary survey of forest insect conditions in Great Britain and Ireland shows that our coniferous woods generally are in an unhealthy condition. Scots pine woods; and young coniferous plantations on the site of or near felled areas of Scots pine are suffering most. Pure larch, spruce, Douglas fir and Corsican pine woods are comparatively free of injurious insects and do not form centres of dispersal." The Scots pine supports the most destructive forest insects and those concerned in our forest nurseries will be interested in the statement, "It is also a question whether Scots pine is not planted too extensively, both pure and in mixture with other coniferous species. From the entomological point of view this is undoubtedly the case, and statistics as to the rate of growth of timber support the contention."

Perhaps the most important conclusion derived from this study considered in relation to our Canadian conditions, is that the large amount of neglected slash, left from the extensive cuttings made in Britain during war times, has been considered responsible for the extensive injury to green timber caused by various bark and wood boring beetles. The abundant food supply furnished by the slash enabled the beetles to breed rapidly to immense numbers so that they successfully attacked and killed the living trees. "Proper cleaning and thinning of woods are most important factors in insect control. Dying, suppressed and fallen branches, and dying and sickly stems, all serve as breeding ground for insects. Such branches and trees are for the most part removed in thinning operations, but it is essential to see,if they are not removed, that they are rendered useless as breeding ground for bark-beetles by removal and burning of the bark. The effects of careless or neglected thinnings are to be seen in most pine woods in Britain."

It should be noted here that the same relation between neglected slash and insect injuries exist in our Canadian forests. The Division of Forest Insects at Ottawa has repeatedly demonstrated that slash from pine, spruce and balsam cuttings is a dangerous breeding ground for injurious boring beetles, which increase rapidly in the slash and spread from the slash into the green timber, and by killing mature, weakened and unhealthy trees, sometimes in very large numbers, cause a constant and serious drain upon the forest.

J. M. SWAINE,
Entomologist in Charge of Forest
Insect Investigations, Ottawa.

AIRCRAFT manufacturers and others in Europe who are interested in the development of civil aviation, have their eyes on Canada and are just awaiting a sufficient development of aerial travel to justify them in making investments here for the purpose of competing for aircraft business. This was the statement of Col. J. C. Scott, controller of civil aviation of the Air Board, Ottawa who has returned from a tour of Britain and France, where he was studying air travel developments, particularly from the commercial flying viewpoint.

Col. Scott stated that there had been great development in commercial aerial navigation in these countries, and comparatively speaking, Canada was holding her own as far as aerial development was concerned. In England and France there are well-equipped aerial terminii with all facilities for the care of machines and those who travel in them.

Moonlight reflections on the Ottawa River.

Airplane manufacturers are turning toward metal construction as regards metal fuselage and wings, Col. Scott stated, and commercial machines now are generally either single engine type carrying eight passengers or double engine planes with capacity of 16 persons. Machines are now being made with all the comforts possible for passengers.

Aerial navigation is being developed and special courses for pilots and navigators are conducted so that they can be properly trained. Research work in meteorology is also being carried out, weather conditions being reported by wireless, telegraph and telephone to all interested in flying. Development of meteorological information in Canada is looked upon as an essential part of any preparation for commercial flying.

Timber Areas of the World Outside Canada

A SYNOPTICAL review of the forest areas of the world and the genera or species of trees under various conditions of temperature, elevation and rainfall, is of practical use to the exporter and importer of lumber of all kinds for structural, cabinet and decorative work, to the maker of mill machinery and also to those whose interest lies in the application of any method by which the enormous waste of wood may be saved as raw material for chemical and other by-products. The importance of the last point may be realised when we note that official statements of the U.S.A. Government declare that out of a total output of 9,500 million cubic feet in 1906 no less than 5,407 million cubic feet were wasted, and, of this, 2,858 were wasted at the mills, and 2,560 in tne woods.

Such a sketch will bring into relief the localities where sawn logs and manufactured timber would naturally form an industry and where mills would be abundant, the district, again, from which rough hewn logs are carried overseas unsawn, and those in which the reserves of timber are at present unexploited.

Now that most countries are reaching out for trade in inner recesses of the world and for return cargoes, and now that aerial photography is about to bring true accounts of timber limits from untrodden regions, the general reader should not be unaware that there are other trees besides pine and fir, beech and oak, and other timber areas outside of northern Europe and north America.

Taking the equator as a starting line for this sketch the general statement may be made that in the tropics lying between 22½ N. lat. and 22½ S. lat. there is a belt of dense forest covering a very considerable portion of the land. In this belt lie the forests of Central Africa, which include those of the West Coast, the Congos and East Africa; the forests of Burma, the Malay peninsula and Siam, N. Borneo and the Philippines; and those of Central America, Ecuador, the Amazon, Venezuela and the Guianas.

In large spaces of this belt the rubber is the tree of most immediate value, being indigenous in the back country of Guiana and Venezuela, in Burma, the Malay States and through Central Africa as far as Abyssinia, but it hardly comes within our purview, not being, as is the sugar maple, marketable lumber as well as a fountain of juice. The most valuable hardwoods of the world are within these latitudes.

We associate "elephants a 'pilin' teak" with Burmah, but this timber and its varieties are abundant in India, in Siam, where the important industry is in British hands, in the Malay Archipelago, Nigeria and the Gold Coast and other parts of Central Africa. Large areas in Java and the Philippines are also being systematically developed. For 2,000 years, at least, India has drawn on its teak forests, and the Indian Government has for many years been carefully conserving them. For the timber of temples it has always been in demand, and beams are known to have been in a structure for 1,000 years. Teak is greatly used now for "steamship liners" and for railway cars.

Mahogany and Rosewood.

The most expensive of all widely used timbers is, however, mahogany. It is indigenous to Central America and the West Indies, especially in Honduras, Nicaragua, Costa Rica and Jamaica, but it has been long planted in Bengal and Ceylon. This "Spanish" mahogany, which is of special use for aeroplane propellers, is distinct from untrue varieties such as "African," or from the W. Australian jarrah or everlasting wood, which is also termed "Mahogany." Another well known tropical wood is "rosewood," which is a name given to several varieties of tree timber. The best known and finest quality of rosewood is an export from Bahia and Rio in Brazil and from Honduras and Jamaica. Squared logs of rosewood are not found, as the heart of the tree of any size is unsound. The so-called "East Indian Rosewood" or blackwood is a native of East India and Ceylon.

Another tree indigenous to the last named places and S. Japan is the ebony. This black wood is the heart of the tree which underlies a covering of white wood. Other varieties of ebony grow in Mauritius, and in the countries about the Gulf or Guinea. "Jamaica ebony" is an article of export. The general term "ironwood" is applied to woods of very different families having their habitats in Africa and Mauritius, Jamaica, Ceylon, India, Burma, N. Borneo. In Australia and Tasmania the name is given even to varieties of acacia and eucalyptus. A timber known as "false iron wood" is Brazilian. This tropical belt besides furnishing the above timbers produces also many kinds of cedar, logwood and fustic dyewoods, the camphor trees which are useful for woodwork as well as for distillation, and the mora and greenheart of B. Guiana, which are important ship timbers. Ecuador has a virgin forest of 90,000 sq. miles rich in dyewoods, cinchona and other valuable woods. At the recent exhibition of Empire timbers the new decorative woods from India, especially the "Indian silver greywood," attracted attention.

A map of the world shows that south of the broad tropical belt the land area is comparatively small, the only considerable countries being S. America below Rio de Janeiro, the S. African Union, three-quarters of Australia, Tasmania and New Zealand.

The timber of these countries is not of great importance. New Zealand, it is true, was at one time covered half over with a dense evergreen forest, of which two-fifths or all but 17 million acres have disappeared by reckless destruction. What remains is mainly the Kauri (damara Australiensis); the New Zealand white pine, the Kakikatea (a tough wooded tree of the yew family), the Rimu or red pine and beech, with other hardwood. The important export, kauri gum. is a resin found in lumps where the kauri grows. New Zealand timber is exported almost entirely to Australia.

In Australia.

In Australia there are 70 million acres of timber of more or less commercial value, the largest areas being in W. Australia and N.S. Wales. The chief forest tree is the eucalyptus with its two hundred native species, one variety growing in Victoria to a height of 380 feet. In W. Australia there are two other important varieties, the Jarrah, of special use for piling, and the karri for wood paving. The acacias or Australian waltles are an important genus, and with the eucalypti have been successfully planted in S. Africa. In Tasmania, which is more thickly wooded than the mainland, a special tree is the Huon pine, which is almost indestructible in water.

S. Africa has little indigenous forest (450,000 acres). What there is lies within 200 miles of the south and south-east coasts. In the Transvaal the so-called teak and mahogany, scattered over 10,000 square miles, supply the timber for mine props.

In the parts of S. America below the tropics, excepting the Araucaria in Brazil, which is mostly in the highlands of the tropical belt, and which is suited for all purposes for which pine is used, the timber is confined to about forty million acres in the zone of the higher Andes in Chile. Below Concepcion there are ten million acres of heavily timbered forest, and in spite of ruthless burning and the absence of forest laws there is still a great supply of trees suitable for pulp. Among these are the cypress and Chilean pine (araucaria) and the other conifers "alerce" and "coihu," the tallest trees in the country. The forests of Chile have been considerably exploited, and luma and cypress find markets in England.

The northern hemisphere is the great region of conifers of which a very broad band extends, except for a few intervals in thickly inhabited western Europe, right round the surface of the globe through Siberia, Northern Russia, the Caucasus, northern and central Europe and N. America. Speaking generally, the hardwoods, beech, birch, oak or maple, shade into this from the south, elevation being a great factor in their growth. Elevation also accounts for the southerly extensions of the northern forest down a part of the Pacific slope and into northern India.

This broad conifer belt and the hardwoods merging into it are too well known to detain us. The pines, firs, hemlocks and spruces of Finland, Scandinavia, Russia, Canada and the north-eastern and north-western forests of the United States are common knowledge, but certain features of the timber lying between the tropical belt and the wide band of northern forest may be noted.

The Forests of Africa.

In Africa, north of the Sahara, on the Atlas range and the elevations along the Mediterranean littoral, are found the Atlas cedar and the cork forests that extend into Spain and Portugal. Above these limits as we approach the Pyrenees and the Alps the hardwoods predominate but yield gradually to the conifers of the north. The forests of the new republic of Czecho-Slovakia, though part of the northern belt, may be specially noted. They extend through Bohemia and a part of the Carpathians; of this whole territory 22% is woodland, consisting of pine, fir and hardwoods. The great forests of what remains of Austria and Hungary are a southerly fringe of the great northern belt.

At the eastern end of the Mediterranean are the remnants of the "cedars of Lebanon" and the forests of the Taurus mountain—survivals of the once heavily timbered Asia Minor, whose magnificent water powers and hundreds of populous cities have, owing to the destruction of the forests and many centuries of misgovernment, given place to desert and ruins.

The term cedar has spread from Lebanon to deodars, junipers, cypresses and thuyas, and covers the deodars of the Himalayas and Afghanistan, the indigenous Japanese cedar (cryptomeria), which has been used and replanted for centuries, the white and yellow and the western cedars of N. America and, most fragrant of all, the red cedar (Juniperus Virginiana). Only a few important varieties of these cedars are found in the northern forest belt.

In India the elevation of the Himalayas and their westerly extensions, no parts of which are actually within the tropics, makes the range of timber rather vertical than horiontal. Also, the great variation of average rainfall from 400 inches to single figures greatly affects the vast forests that extend over the mountains above the valleys of the Ganges and Brahmapootra to the great plateau of Tibet.

The zone of which we are speaking contains most of the great deserts, Gobi, the Indian and Arabian, part of the Sahara and others, and, as a consequence, the forest timbers are found only on elevated ranges or on lands affected by the neighborhood of oceans. How far reforestation will affect the climate and partly restore the ravages of axe and fire does not concern us here, but the 150-square-mile-arboretum of pinus pinaster planted in France from the Gironde to Bayonne and replacing a sandy swamp shows what scientific forestry can do. In the United States the centre of the lumber industry has in recent years shifted in the direction of this midway zone. Louisiana, Mississippi and Texas are now respectively second, fourth and fifth of the States in point of lumber production.

Planting Nut-Bearing Trees

A good deal of advice is going the rounds of Canadian newspapers about planting nut-bearing trees along roadsides in preference to trees like elms and maples which do not bear nuts. Many of these newspaper items come from the United States, where the conditions are not the same as in Canada. The advice is good in principle but in detail it is to be received with caution. The fact that a tree grows well in Indiana is not a reason for planting it in New Brunswick or Manitoba. Canada has as fine native trees as any country in the world. Her great trees are pines, spruces, firs, cedars, larches, maples, birches, elms, etc., and in these, no other country equals her. In different parts of Canada, walnuts, butternuts, chestnuts, beeches, and hickories thrive, also oaks, black cherries, basswood, etc. What those who are about to plant a few roadside or lawn trees should do is to *find* out what kind of trees are native to their district and make a selection from these. This is not to say that enterprising citizens should not experiment with desirable trees which are not native to their districts, because in this way advances are made; but it is to say that the practice which has too often prevailed in the past of spending considerable sums of money in planting, say, catalpa, pecans, and soft-shelled walnuts in different parts of Canada on the advice of gentlemen living in California or Virginia is not necessarily good business. Our Canadian foresters know more about tree-growing in Canada than any person outside. The Dominion Forestry Branch has issued two bulletins on this subject for different parts of Canada. Bulletin No. 1, "Tree-Planting on the Prairies," is devoted to the Prairie Provinces, while Bulletin No. 69, "Care of the Woodlot," covers the conditions in the rest of Canada. Either bulletin may be had free upon application to the Director of Forestry, Ottawa.

There is only one way of making the Canadian Forestry Association a fighting power in forest protection: If your membership fee of $2 is unpaid for 1921, put your cheque in the post box to-day. The Association wages its campaigns entirely on voluntary subscriptions.

Soil drifting has become a real problem in portions of the Canadian west where trees are scarce or wholly absent Unobstructed winds have destroyed many valuable areas.

Reforestry in Adirondacks

THE largest privately owned tree nursery in the United States is that of the Delaware and Hudson Railway Company, located at Bluff Point, where each year thousands of Scotch Pine, Norway Pine, Douglas Fir, Norway Spruce, Red Spruce, Poplar, Ash and White Cedar are grown for transplanting on waste lands in the Adirondacks. The industry gives employment to many girls, women and men during all seasons of the year and at wages which provides those employed with more than a comfortable living. This nursery is one of the most interesting spots in this part of the State, showing as it does the growing of the trees from time the tiny trees, only a few inches in height, are carefully taken from the transplant beds and shipped to the planting fields in the Mountains.

The reforestation project was first undertaken by the Delaware & Hudson Company in 1907, and the following year the Company secured from the Federal Government sufficint trees for the planting of 15 acres in the vicinity of Wolf Pond, there being 18,000 trees set out that year.

In October of that year the Delaware & Hudson Company placed H. R. Bristol, a trained forester, in charge of their reforesting operations and immediately enlarged upon their proprogramme until to-day they have the largest forestry programme in the country. In October, 1908, extensive forest fires in the Northern Adirondacks played havoc with the forests of the Adirondacks, but the then new superintendent of the operations was not to be discouraged by this set back, and under his guidance the Company continued their reforstry work with renewed energy, the result being that in the few years which have elapsed between that time and the present the Delaware and Hudson Company's reforestation operations have been enlarged from the modest fifteen acres of 1907 to over 9,000 acres at the present time.

The nursery at Bluff Point is to the novice the most interesting part of the reforestation operations. There are trees are grown from the seed. The nursery contains seventeen and a half acres, and has at the present time over 200 seed beds. Each of these beds are twelve feet in length and four feet in width and at the time of germination each bed contains upwards of 14,000 seedlings. These are watched and cared for with the tenderness that a mother bestows upon her first born. Each bed has a covering of the finest wire to prevent the birds from picking at the tender plants as they appear above the ground. Each bed is daily inspected by an expert to see that injurious worms or diseases which might destroy the tiny trees do not find their way into the specially prepared earth in which they are planted. As time passes the weaklings in the bed die out and at the proper time the remaining plants are removed to the transplant beds, where they have more space in which to grow and develop. Here they are cultivated with the greatest care, and scores of women and girls are kept busy during the summer season removing weeds which might retard their growth.

The trees are left in the nursery until they are from two to three years of age, depending upon species, when they are removed to the scene of the reforesting operations. These operations are begun during the early part of April, and are continued about two months, during which time the field gangs under direction of trained foremen plant hundreds of thousands of the trees in soil which will bring the best results. During the past season over a million young trees were planted by the Company, and Superintendent Gristol has arranged a planting schedule covering the next three years which will add several million to the number of trees which will be set out each year on land which was nothing more than waste land until the Delaware and Hudson Company took up and developed their forestry work.

The reforestation of the upper Adirondacks is adding future wealth to this section, for the great cry of the present time is the rapidly growing shortage of timber, and with the present operation of the Company continued for a few years longer this section will incrase in value.

ONE of the curious epistles sometimes received from Chinese laborers in the lumber mills of British Columbia has reached the hands of a well-known manager.

"dear Sir,—We would like you to Perform your Previous Promise of increasing our wages. We Remember that you Promised us before, that you will increase the wage as soon as other mill do that same to our Party. Now information have reach us, that all other mill, etc., such as Frasier mill, shull mill, and etc., have made a raise in our Chinese workers already; consequently we respectfully give you the request, dear sir, we do this by compulsion, you know the expense of living now a day has been awfully vast. Take rice instance, we have to pay $7 for a sack of rice, sir, you can imagine how hard we are living. Hoping you approve our request and expect you answard as soon as possible, very Truly your—

Sawyer, packer and the others."

Application has been made to the Quebec Legislature to incorporate forest engineers as one of the closed professions. One of the conditions of admission to this body would bet a diploma from the Forest School of Laval University. The executive would have power to draw up a tariff of fees which would have all the force of law before the courts. None others than members of the Association could term themselves Forestry Engineers under penalty of fine or imprisonment. A protest was registered against the proposed act by Dean Adams of McGill University, who objected to membership in the Association being made conditional upon securing a diploma of only one Forest School.

What the forests of Northern Ontario mean to the maintenance of the Temiskaming and Northern Ontario Railway may be judged from the fact that during the past year 703,000 tons of freight out of a total tonnage of 1,361,000 tons represented the products of the forests. Pulpwood taken from free-holding lands and largely destined for United States mills represented 329,000 tons.

Ontario's Forestry Problem

THE opportunity for the beginning of a new era in the forestry situation in Ontario was created by the recent announcement of the Provincial Government that henceforth the timber administration on Crown lands will be under the Provincial Forestry Branch, instead of comprising a separate organization, in which no foresters were employed. This is the most important development which has yet taken place in the forestry situation in Ontario.

By this action, assuming that its logical consequences will follow, Ontario aligns herself with the Provinces of Quebec, British Columbia and New Brunswick, which had already recognized the necessity for taking thought for the future by making foresters responsible for the technical administration of Crown timber lands. A partial example had been set by the Dominion Government at a still earlier date, when the Dominion Forestry Branch was placed in charge of the timber administration on Dominion forest reserves in the west, exclusive of licensed lands or timber limits.

Nova Scotia has almost no Crown timber lands, nearly all her forests having passed into private ownership many years ago. The need for a provincial forest service there is based upon the opportunity for the development of better forestry practice on these privately-owned timber lands, and upon the urgent need for a greatly intensified system of forest protection, to cover all the forested area of the province.

Prince Edward Island is not a forest province, her land area being very largely under cultivation.

Ontario is then the last of the forest provinces to recognize the necessary and logical connection between forestry and foresters. The recent action should and no doubt will mark the beginning of an era in which the fullest practicable consideration will be given to so regulating the methods of cutting on Crown lands as to leave them in a condition to produce another crop of valuable timber species. It has been thoroughly established that logging operations in which cutting is not regulated with an eye to future productivity are generally destructive to the quality and quantity of the future growth. Each area requires to be carefully studied in advance of cutting, so that the method of treatment to be prescribed may be adapted to local conditions and at the same time be practicable from the operator's viewpoint, to say nothing of being reasonable from the viewpoint of additional cost involved.

Ontario is to be congratulated upon the progressive action taken in thus far recognizing the need for a technical administration of Crown timber lands. The Provincial Forestry Branch has a great responsibility and a great opportunity for public service in the prospective addition to its previous work of forest protection, of the inauguration of forestry practice upon the great areas of Crown lands which have now come under its jurisdiction. Progress will necessarily be slow; economic conditions must be fully recognized; and it will take time to develop the kind of organization required for so large a task. Public sentiment, is now undoubtedly fully ripe for the development of this situation along the most modern lines. It must, however, make itself actively felt, in support of a really progressive forest policy.—Clyde Leavitt, in Conservation.

Forestry in the British Isles

The annual value of the imports of timber and timber products into the British Isles previous to the war was about £40,000,000, and about 80 or 90 per cent. of timber imported was coniferous. A considerable proportion of this might be grown in the British Isles, where huge tracts of land could be more economically occupied in growing trees than as at present, and healthy occupation thereby provided for a much larger rural population, of whom a proportion would be small-holders, reaping the benefits of both forestry and agriculture.

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Black Spruce on the east side of Manitouk Islands, east side of Hudson Bay.

Photo by Frits. Johansen.

Larch and Spruce trees in the valley of Second River, east side of Hudson Bay.

Photo by Frits. Johansen.

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Meagre Forest Resources Bordering James and Hudson Bays

By Frits Johansen, Ottawa, Can.

Geological Survey

THE "Canadian Forestry Magazine," for November, 1920, contains an article by Dr. W. T. Grenfell about the forests of the Labrador Peninsula. It treats mainly the east coast and tributary rivers, though there is a short reference to the observations made by Dr. A. P. Low and others in the western half of the peninsula. From the point of view of the northward distribution of the different trees making up the forests in the northland of Canada the east coast of James and Hudson Bays is particularly interesting; and as I made a four months trip here, to beyond lat. 56°N., in the summer of 1920, a short article about this region may be of interest to the readers of this periodical.

As the main purpose of my trip was marine investigations, on behalf of the Biological Board of Canada, and I therefore spent most of my time upon the sea, the observations of the forests made were more of a general nature, supplemented by the collecting of forest-insects and a number of photographs, some of which are reproduced here.

First as to the different species of trees occurring there:

While the Cedar (*Thuja occidentalis*) does not reach the shores of James Bay, and has its northern limit just south of the mouth of Rupert River, the two species of poplar occur all the way north to the neighbourhood of the boundary between James and Hudson Bays, Cape Jones. One of them, the Balsam Poplar (*Populus balsamifera*) has its northern limit at "Bishop Roggan River," and is limited to the heavy, marine clay-soil in the river-valleys, until about 100 miles from the coast. The other the Aspen (*P. tremuloides*) extends north to the vicinity of Cape Jones, and inland to between the upper and lower parts of Big River. It is mainly found as second growth, together with the white birch, or in clumps in the original forest.

The Jack Pine (*Pinus banksiana*) does not come down to the coast, but is found in the interior north to the south branch of Great Whale River.

The Canoe Birch (*Betula papyrifera*) occurs along the coast north to near the mouth of Great Whale River, and is found inland at the head waters of the south branch of the same river. The most northern representatives of it are clumps of small trees, and north of the vicinity of Lake Mistassini they are not big enough for canoe-making, so birch-bark has to be imported from farther south, for the use of the Indians there.

The Balsam Fir (*Abies balsamea*) is the typical tree around the larger streams and lakes, and extends north to the vicinity of Great Whale River.

The three other species of trees occur throughout the wooded part of the peninsula.

Of these the White Spruce (*Pica alba*) seems to depend, for its occurrence, particularly upon the marine deposits, whether sandy or clayey soil, and is not nearly so dominant a tree as in the western part of the subartic Canada (see "Can. Forest. Journ.," for July, 1919).

Balsam Fir Prevails.

The Black Spruce (*Picea nigra*) is extremely common upon both sandy, hilly, or swampy soil, and it has been estimated, that it forms about 90 per cent. of the forests, up there. To the south its growth is very thick, but farther north more open, and the trees are better developed, with the branches spreading, as in the case of white spruce. It will be seen from the accompanying pictures, that even near its northern limit the trees reach a considerable size, on protected places of the mainland and large islands. Its insect-pests, however, follow with the tree all the way north, as proved by the several species of bark-beetles I collected from it at various localities from Charlton Island in south to lat 56°N., and which have later been kindly identified by Dr. J. W. Swaine, of the Department of Agriculture, Ottawa. Along the coast the most northern spruce-trees are represented by a scattered growth of perhaps 50, more or less dwarfed trees at the foot of the cliffs on the north-side of the entrance to Richmond Gulf, but a little inland in the same vicinity the growth becomes much more extensive, and the trees better developed.

Finally the Larch (*Larix americana*) extends as far north as the black spruce, though mainly in swamps and along the rivers, and the trees are surprisingly well developed, even at their northern limit. They generally grow more or less single, scattered among the black spruce, or flung out over the river-valleys and islands, so that the lovely shape of each tree and its delicate, light-green needles stand out. Unfortunately it is in the southern part of the peninsula almost totally destroyed by the ravages of the imported, European Sawfly (*Nematus Erichsonii*), which seems to be spreading north and east-ward. Particularly the large trees are also attacked by bark-beetles (*Dendroctonus simplex*, etc.)

Fires From Careless Indians.

It may be said in general that no commercial timber occurs in Hudson Bay, and even in James Bay the lumber for the small saw-mills found at Fort Albany, Moose Factory, and Rupert House, is cut some miles up the river each place. There is however any amount of trees suitable for spruce-deals, not to speak of pulp-wood, much farther north along the east coast of James Bay, but it should be remembered that the rivers here present many obstacles for transportation, and their upper reaches are largely unknown, except to a few Indians.

During the last fifty years or so, very extensive forest fires have destroyed almost half of the trees in the interior of the peninsula, springing up every summer, largely owing to carelessness on the part of the Indians making fire-signals or leaving camp fires behind. Much valuable timber has thus been destroyed, without anybody benefiting by it, the second growth of black spruce, jack pine, birch and aspen not being nearly so good as the first. There is no fire protection nor representatives of the provincial or federal governments in the whole area of James and Hudson Bays treated here.

A characteristic feature of the forests along the rivers and lakes up there is the dense undergrowth of shrubbery, composed mainly of willows, alders, viburnum, etc., with "Labrador Tea," "Laurel" and other smaller bushes in the open glades further into the woods. In the southern part these bushes also occur at higher elevation, above the tree-line, and are accompanied by the dwarf-birch on open places towards the north. Particularly in Hudson Bay, where the woods are more open, and often are found only on swampy places, the bottom between the trees is covered by a thick mat of *Sphagnum-mosses,* with at least as heavy a coating of reindeer-moss (*lichens*) on the open stretches. Beyond the limit of trees, in the northern part of the peninsula the shrubbery is made up almost exclusively of the artic species of willows and birches, well developed on protected places, but dwarfed and with a prostrate growth where exposed to the wind.

While along the east side of James Bay the woods are practically continuous from near the beach inland, they become northward, in Hudson Bay, more and more scattered, and the trees are found mainly in "pockets" here and there. Of the larger islands in James Bay those centering around Charlton Island are heavily wooded, but the Twins and the smaller islands farther north have only a few, scattered and dwarfed spruce-trees, similar to those found upon the islands in close proximity to the eastern shore of the northern part of James Bay.

Birds in the Far North.

Certain species of birds characteristic of the woods are found as far north as the trees go; and even where the latter are dwarfed song-birds will build their nests in them. Beside their great importance to the natives and other travellers in the region in question, by furnishing material for camping and implements, the trees have an aestetic value which cannot be overestimated. They give colour and relief to an otherwise dreary coast; and I have seen few more beautiful sights than the wide expanse of Richmond Gulf, bordered by many-coloured rocks, with groves of dark green spruce growing in pockets along bays or on protected points, and reflected in the clear, blue water. There is here a scenery which has evoked the enthusiasm of the comparatively few white men who have visited it; and which might very well in the future be made a reservation for the benefit of all those who love outdoor life. Its protected location, wealth of marine life, and possibilities for hunting are fully appreciated by the Eskimos living here all year round, and who know far better than many white men how to utilize their country.

Along the east coast of James Bay the forests exhibit in the fall a riot of colours impossible to describe. The dark green of the conifers, the orange-yellow of the birches and poplars, and purple shrubbery are only the extremes and dominant colours along a coast which with its innumerable islands and inviting bights makes a passer by feel like in fairy-land. It was my good fortune, by going down the Missianibi, and back up the Abitibi Rivers, to follow from day to day the transformation of the woods through the summer to their defoliating in the fall.

But most often do I like to recall those brave, little, shrubby trees on the many islands and windswept coast of Hudson and James Bays, standing up, firmly rooted, and of so fantastic a shape, against a clear sky at sunset. May they be spared, as monuments of endurance, during any development of the country, which may take place in the future!

Ottawa, Can., March, 1921.

This looks like a real national asset—Spruce on the shores of Highwood River, Alberta.

A roadway glorified! Ontario will in a few years possess 1,800 miles of such highways. Room for wires but no mutilation of trees.

Beautifying the Provincial Highways

By Henry J. Moore, Forester, Public Highways Branch of Ontario

IN conjunction with its policy of good roads, the Ontario Government have established a policy of Beautiful Roads. Good roads are an absolute essential from the view point of national progress which means the development of our natural resources. The creation of industry. Better homes and better living conditions, thus, fewer homes for the destitute to be maintained, lower tax rates and better financial conditions. Beatuiful roads are an absolute essential from the viewpoint of spiritual progress. The development of beauty to inspire the soul, to fill the minds of men and women with lofty thoughts, to make them forget their selfishness, to drive out sordid thoughts and to educate the children who will be the citizens of the next generation.

Beautiful roads mean increased farm and suburban property values, more valuable on account of the asset of beauty which previously did not exist, more desirable as residential areas on account of the refining influence of their beauty, more attractive to tourists than roads that are not beautified, and thus altogether more desirable. Beautiful roads are essential if for no other reason than for the fact that men and women live their lives upon them and the expense of beautifying them is justified for this reason alone. What a world this would be were there no beauty along the main arteries of life, along the great human highways. No trees, birds or flowers to cheer and to gladden? What a calamity it would be were all of us to consider the road merely as a medium for making money, as a means of getting quickly between two points, forgetting that it should be the thing we live. Beautiful roadways in Ontario will be an asset, the value of which cannot be comprehended in terms of money.

Treeless Roads Mean Dreary Travel.

Why should not the main roads of Ontario be beautified. Why not those of every province? To-day less than 25 per cent. of the total length of the 2,000 miles of Provincial Highways in Ontario are tree lined, 15 per cent. of these trees are diseased or are out of proper alignment,—leaving only approximately 10 per cent. in good health, and in satisfactory positions. To align beautiful trees along these main arteries, or to lay out park spaces at intersections will cost the Province a comparatively small sum, and as this cost will be distributed over many years

Good roads and beautiful roads are essential to civilization. Tourists who pass along this road cannot help but be impressed with its grandeur.

it will be negligible when considered in the light of what has formerly been said in this article.

The actual work of beautification started during October of last year (1920) when planting operations were commenced on the Kingston Road between Toronto and Port Hope, thirteen miles of trees being set out, and a small park area near Port Hope known as Welcome Corner was beautified with trees and shrubs. During the present year planting will be resumed on this Highway with the ultimate object of beautifying it entirely between Toronto and the Quebec border, a distance of approximately 280 miles. A small area at an intersection near Cobourg is to be beautified during the year. Planting will also be undertaken along the Queenston-Hamilton Highway, another gateway into the Province, and will be continued through the various years until the distance of approximately 50 miles is completed. Along the Niagara-Falls-Windsor and western branches of the Provincial Highway system planting will be undertaken as the sections are completed.

Is this the best in road-making that a prosperous county can achieve? Note from the other pictures the difference made by tree planting.

The provincial Highway leading to northern points will receive attention in due course but little beautification will be attempted during the present year as the construction of these has not reached the stage at which the work may satisfactorily be done. The approaches to one or two towns and cities will however be given attention. Sarnia, an extreme north western city, having expressed a desire to co-operate in the work, the approach will be planted. Chambers of Commerce, Municipal Councils, Horticultural Societies and other prominent and influential bodies have entered heartily into co-operation in the scheme of beautification, and are rendering splendid aid to the Department.

Will the necessary work of maintenance be very expensive? No not so great. Trees once established do not require exceptionally great care if they are properly pruned when planted, and sprayed when insects menace. Much of the work of cutting grass and any weeds along the beautified roads it is hoped will be done by adjacent residents. Community organizations are being formed and men and women have offered to undertake the supervision of the maintenance in their particular localities. If each resident will cut the grass along his or her frontage, much will be accomplished, and considerable expense be saved the Government.

Helping the Householder.

What is the Department of Public Highways prepared to give in exchange for this service? It will plant the necessary trees and shrubs along the road side, and to every resident along such highways who cares to ask for a plan to make possible the beautification of their own property, that is, the frontage between the houses and the fence line along the road, such a plan will be given. In this way not only may the planting strip along the road be beautified but the front lawn of each farm or suburban home be beautified. The resident will, however, have to purchase the trees or shrubs to plant on the private property.

Will cattle be allowed to stray on the roadways and be allowed to injure the trees? No, the law to prevent such a possibility will be put into effect so that no injury may accrue. Neither will the pruning of trees, cutting, mutilating or injuring in any way be permitted. The Resident Engineers have received instructions to warn any one who attempts to harm or to interfere with the trees and shrubs, to desist. Failure to comply will result in the law taking its course. There already being a law in force, and a penalty will be inflicted. In this matter as in all others Municipal bodies may be of great service to the Department of Public Highways, which is really their Department and which is exercising its help and influence to change the places in which they have their being, into places of beauty.

In the choice of trees permanency will be largely the deciding factor. Trees of long life and of great durability will largely be planted. Red and white Oaks, Black Walnuts, Hard Maples, Elms, Native Planes and White Ash, will grace the roadsides away from the towns and cities. Those which are largely indigenous to a particular locality will be used. At the approaches to cities where an air of artificiality pertains many of the exotic shade trees may be planted such as Norway Maples and Oriental Planes to supplement the native trees, but in no case will exotics be planted out in the country along the roads.

The Canadian Highways should be beautified by Canadian trees and when so beautified will stand as examples of national usefulness and of national beauty, typical, unique, and worthy of a great country now throwing off the cloak of apathy and responding in the fullness of its great soul to an inspiration. Surely the fruits of this inspiration will be such as to inspire those who follow, for its source is not in the human heart but in that of the Deity.

The Prosperity of Canada is Propped up on Timber.

The Forest has been called the Mother of Civilization.

At whatever point you make a contact with Canadian industry—whether the farm, the mine, the fisheries, manufacture, whether the machinery of production or distribution, whether you build ships, grow peaches, or read a newspaper you establish your dependence upon the Canadian Forest and the materials and services rendered by it.

Every reader of this is a shareholder in Canada's forest resources and a responsible partner in their protection against fire. Therefore:

This is a good thing to keep in mind next time you are in or near a timbered area:

No forest can resist your unextinguished campfire, your tossed-away match or lighted tobacco.

Put out every form of fire in a forest—Dead out!

Not because it is the Law, but because it is Right.

How A Prairie Town Built Itself A Park

THE treeless prairie towns and villages suffer a handicap in the establishment of parks through the lack of any wooded areas where a start might be made. While the value of parks is generally recognized and land is frequently available the first cost of the improvements and the annual cost of maintenance, generally unknown quantities, stand in the way of the ambitions of the community.

The experience of the Town of Davidson related below will show one method how, at a relatively small outlay, a small central park can be established and maintained.

According to Mr. H. G. Arnold, Chairman of the Parks and Streets Committee, a new park of nearly one and one-half acres in area was laid out last year adjoining the site of the town hall. The land was bought up at a tax sale, and the cost of the same, outside of the value of the land, has been about $650 made up as follows.

Fencing two strands of smooth wire	$ 36 00
Ploughing, etc.	20 00
Cinder walks	18 00
500 six to seven foot trees	175 00
400 shrubs, 4 feet	160 00
80 pounds lawn grass	33 00
One pound Caragana Seed	6 00
Upkeep for one year	200 00
	$648 00

The trees planted were chiefly Manitoba Maples, Elms and Ash, and the shrubs used were Lilacs, Spireas, Honeysuckle (*Lonicera*), Alders, Russian Olive, Amorpha and Flowering Currant.

The cost of the work has been borne by the parks fund and the town together, the parks fund being derived from the proceeds of an annual concert.

This unique method of providing for the annual upkeep has again proven a success as at a Burns' night concert recently held, the sum of $220.50 was cleared. As Mr. Arnold says: "This year the ratepayer has already paid for the upkeep by patronizing the concert and he had a good time as well; also largely helped by the country people who take as much interest in it as we do if one puts the matter up to them in a proper manner."

FARMERS USE 46% OF NATION'S WOOD PRODUCTION

"AGRICULTURE is the greatest wood using industry of the United States," said Colonel W. B. Greeley, Chief of the United States Forest Service. "Forty-six per cent. of all the wood which the country consumes annually is used on its farms. The yearly lumber bill for farm structures and improvements aggregates six and three-quarters billion board feet! Farm requirements for boxes, barrels, and other articles manufactured from wood call for nearly four billion board feet additional each year. Add to these requirements the eighty million cords of fuel wood consumed annually by farmers and over a billion cubic feet of fencing material and it is easily seen that farmers have a greater interest in an assured supply of timber at reasonable prices than any other class of American citizens.

"The farmer is the most independent of anyone in the nation when it comes to food. He might be equally independent in the matter of timber. He owns, in the aggregate, more feet land than the lumbermen and all other private owners combined. Farm woodlands. reach the enormous total of one hundred and ninety-one million acres and comprise two-fifths of the forest area of the United States. East of the Mississippi River they cover one hundred and fifty-three million acres, or forty-five per cent of all the forests. A rough estimate places the timber standing in the farm woodlots of the Eastern States at three hundred and forty billion feet, or forty per cent. of the timber in this region. And this quantity includes over half of our remaining hardwoods."

North China and Its Wasted Forests

Two years ago, writes Mr. S. R. Thompkins, of Lethbridge, to the Forestry Magazine, I had the opportunity of a journey through North China from Harbin, in Manchuria, as far south as the Hoang-Ho, and during that time the one thing that struck me most forcibly was the imminent peril in which humanity lives in this corner of the world as a result of destroying the original forest cover. From Shanhaikwan, where the railway pierces the Great Wall, the traveller sees at varying distances to the west mountai ranges standing up gaunt and forbiddin and grey against the sky, while at every stream he crosses there is abundant evidence of the destructive forces let loose over the land by these same mountains after every rain; in the intervals between the river beds are practically dry.

A great waste of sand at the mouth of one of China's dry rivers. In Manchuria great areas south of Mukden are covered with sand-dunes—the sand necessitates the employment of special gangs of coolies to keep the tracks clear. Around Pekin and Tien Tsin in spring before vegetation is advanced, the soil being dry and fine, responds to every breath of wind, and for days the air will be filled with dense clouds of dust—soil drifting far worse than anything in Western Canada.

Not China, but Canada. We have about 1,000,000 square miles on non-agricultural soi turned into a waste like this.

DEFORESTATION AND CHINA'S TROUBLESOME RIVERS.

A picture of a river in April taken to the north of Tien Tsin. This river has a trickle of water in it, but many are absolutely bone dry at this time of year.

The other side of the picture shows the result of a previous year's inundation along the Haong Ho. The view was taken looking along the dykes. It is almost impossible to confine the tremendous volume of water that descends during the wet season from the mountains, and a flood is liable to be attended with disastrous results.

That China will support trees is quite apparent from the number of sacred trees everywhere in evidence. The picture shows a sacred grove in one of the very numerous graveyards. These trees would long ago have succumbed had they not been protected by their religious associations. The area covered by these groves is of course infinitessimal as compared with the total land under cultivation.

Precautions in Planting Shade Trees

By John Mackintosh, Acting Parks Sup't of Regina

"THE hole or pit which is to receive the tree," advises Mr. Mackintosh, "should be dug to the depth necessary according to the size of the plant. It should be large enough to get all the roots spread out and not closer to the edge of the pit than four to six inches.

"The general practice is to dig a hole about four feet in diameter to the depth of one foot six inches. The soil in the bottom is then broken up to a depth of another four to six inches to provide drainage in case of excess moisture, the rootlets being very susceptible to either excess moisture or excess drought.

"The material from the pit should be well broken up as it is thrown out, so as to get well aerated and release the plant food on which the rootlets will rely for future development.

"Having selected the variety of tree to be planted it is important to ensure its being planted in the best possible condition. The tree should not have been dug so long that its roots have become dried by the sun. Before planting immerse all the roots in a barrel of water for ten minutes or so. Examine the roots for shattered ones, which should be cut clean across. Reduce the top so as to have only as many branches as will give the tree enough reserve sap to supply the newly-formed roots.

"In planting or setting, the tree should have the very best of care. The pit should be refilled to such a height that the tree will be planted not more than six inches deeper than it stood in the nursery. Too deep planting must be carefully avoided especially in the case of elm or ash.

"The roots should be evenly spread out across the surface of the soil dipping them slightly towards the edge of the pit. They should then be covered to a depth of six inches with the finest of the excavated soil. From this depth up to the level of the surrounding earth, the soil should be firmed with the feet. The remaining soil loosely placed over the top of the pit will form a basin.

"If the weather is not too dry, the basin filled with water twice at time of planting should provide sufficient moisture. Spraying the tree every evening at sundown and in the mornings before sunrise should ensure a successful job."

The Loyal Spirit of Our Members

A Few Typical Letters from the Canadian Forestry Association's Mail

I feel that the Association has a distinct place in our national life and ought to be supported. JOSEPH N. SHENSTONE, First Vice-President, the Massey-Harris Co., Toronto.

We appreciate very much what your organization is doing and are heartily in sympathy with the work carried out by the Canadian Forestry Association. NICHOLSON LUMBER CO., Burlington, Ont.

I am delighted with the Forestry Magazine and am pleased to be a member of the Forestry Association. Being a wood-ranger myself, you can imagine how these articles appeal to me. H. J. D. HAMMOND, Dryden Ontario.

I have been greatly interested in the improvement made in the Canadian Forestry Magazine and to learn through it of the excellent work you have been doing in the interest of forest conservation. I wish you a very successful year in your arduous and uphill work. W. G. CLARKE, Bear River, N.S.

It is the best value of any publication I receive. You are doing a splendid work in endeavoring to educate Canadians in the value of their timber heritage. L. A. GREEN, Sault Ste. Marie, Ont.

I must thank you very much for being so kind as to remember us boys down here in bed with your wonderful paper. We all join together to thank you as we appreciate it beyond expression of words. GEORGE T. WATCHORN, Ward E 2, Bed 6, Military Hospital, Ste. Anne de Bellevue, P.Q.

I feel you are leading in a grand and noble work, because you are doing it for the future generations of Canada. May you never become weary in well doing. DANIEL T. HEISEY, Kitchener, Ont.

I take a great deal of pleasure and instruction in reading the Forestry Magazine. I admire the good work you are doing for Canada. L. R. JARVIS, Toronto, Ont.

I am pleased to continue as a contributing member, knowing something of the good work that the Association has done and how necessary it is in the interest of our common heritage that it should be continued. MARK BREDIN, Toronto, Ont.

I may state that I enjoy the Forestry Magazine and derive a lot of benefit and valuable information from it. A. J. WASKETT, Revelstoke, B.C.

I very sincerely congratulate you upon the wonderful success of the Association during the past year. It certainly reflects the greatest credit. PERCY B. WILSON, Sault Ste. Marie, Ont., (President Can. Pulp and Paper Assoc.)

The Association is doing magnificent work and is deserving of the strongest support possible from all Canadian interests. COL. J. S. DENNIS, Montreal, (Chief Commissioner of Colonization and Development, C.P.R.)

Great Results from Jack Pine Planting

By M. J. Stevenson, Morris, Manitoba

THIS tree is found growing over a very wide range. It represents the extreme limit of hardiness of all the pine family. It grows from northern Quebec to well within the Artic circle down the McKenzie river almost to the limit of tree growth. No evergreen grows faster while young, than this. The white and Norway pine will overtake it sooner or later, but for the first 25 or 30 years of its life I have never seen an evergreen that will equal it. This tree has been called the fire pine, from the fact that a great many of the cones hang on the tree for years unopened until a fire sweeps through the forest melting the pitchy covering allowing the cones to open. The seeds are scattered by the wind and an even aged stand is the result. It starts to bear cones while very young. I have often found young trees 3 feet high loaded with cones. It seems to grow with equal vigor on sand or clay and will grow on sandy sterile soil where another evergreen could not exist. It is easily grown from seed. I have grown a great number from seed with good success under prairie conditions.

Rate of Growth.

In 1888 in eastern Manitoba a jack pine forest about a section in extent was entirely killed by fire; not a green tree was left over the whole area. This was an even aged old growth stand one hundred and thirty years old, apparently having come in after an Indian fire. These trees were from 10 to 20 inches in diameter and from 80 to 90 feet high. This timber was all cut within 4 years. By this time the young jack pines seedlings were as thick as wheat over this area. These trees got leave to grow till 1897 when they were again entirely destroyed by fire. This fire was an intensely hot one owing to the amount of tops and debris left from the former forest most of the young trees were entirely consumed and I thought as I walked over the blackened waste this is the last chapter in the history of this jack pine forest. But no! Going over this area 4 years after the last fire I was agreeably surprised to see millions of the young hopefuls again sticking their heads up through the snow. The last time I saw these trees was in 1908. What a revelation! Many of them were from 18 to 20 feet high by actual measurement and from 3 to 5 inches in diameter. They had far outstripped the birch and poplar growing with them and these trees had the advantage in that in nearly every case they were found growing from old roots. Even on the heavy clay loam of the Red River valley their growth while young is remarkable. A plantation of this species set out 8 years ago are now 12 to 16 feet high. Some White and Norway pine set out the same time under the same conditions are not more than half this height.

At least two thirds of all the tie-timber used by the railroads in Manitoba is jack pine. It makes a good tie, lasts fairly well, especially the old growth. It will grow to tie-timber in from 50 to 75 years. It makes good lumber; a great deal of it is sawn and sold as Norway and White pine in the west. The old growth makes excellent fuel being as a rule very pitchy. And now since it is known to make good paper great inroads will be made on the jack pine forests to supply pulpwood, as it will grow to pulpwood size in about half the time it takes the white spruce. In the early days there were splendid stands of this species but repeated fires have almost exterminated it where it once reigned supreme. In eastern Manitoba we have vast areas specially suited to the growth of this species which today is producing nothing but grass and useless brush. Now when our timber supply is on the wane we find a tree so desperately eager to help us out we ought at least to protect it from fire.

UNITED GRAIN GROWERS

Winnipeg, April 5, 1921.

"The Directors appreciate the splendid work which is being done by the Canadian Forestry Association."

E. J. FREAM,
Secretary.

A promising forest of fir killed by a single forest fire. The next step is an invasion of insects, then a harvest of windfalls and after that stage, a few fires and then—desert.

Importing Tree Seeds--A Question?

I AM a very interested reader of your Forestry Magazine and have seen in your last number under the annual meeting of Forest Engineers that at this meeting, a resolution was passed advising that the duties on seeds and nursery stock for forest planting should be removed. Allow me, in connection with this, to sound a note of warning which I should like you, if you find it advisable, to print in your magazine.

I am a Forest Engineer, a graduate of the University of Copenhagen (1904), and since my seventeenth year have been occupied with forestry work in Sweden and Denmark. I am at present in charge of the forestry work of Price Bros. & Co., Lt., on the limits supplying their pulp and paper mills at Kenogami and Jonquiere.

During my practice as Forester, I was for four years the owner of a private forest nursery which mainly supplied the Danish Government forests with seeds, and nursery stock. At this time I got in connection with most of the European seed merchants and nursery owners. It might be of interest to your readers to know from where the European seeds and nursery stock is mainly supplied.

Nearly all the seeds for the nurseries are sold by two big firms, Helms and Sohne, Thuringen, and J. Rafn, Copenhagen, Denmark. They are both very big firms who supply a number of smaller firms, who themselves might collect some few species of local seeds, but mainly depend on these two big firms for all their American, Siberian, and European seeds. If required, these firms will supply you with seeds from any locality and race you might want, but generally speaking, the most common species are either collected in Germany or in Scandinavia. The Scandinavian seeds are mostly from the South of Sweden and the coast regions of Scandinavia; the German seeds from Southern Germany.

These seeds are then, mostly without any specification, sent out to the nurseries and seeded. The nurseries in Europe have specialized. Most of the young seedlings are made in Belgium, Holland and Northern France, especially in the Department Calvados. The climate here is mild, the loam black and very rich, of a swampy nature, where water is always found very near the surface. The watering is most often done by opening or closing ditches running in a draining system through the marshy land. These nurseries themselves often collect the seeds of the most common species for their own use. On account of these very favorable conditions, the nurseries are able to produce a beautiful even-looking product of an uncommonly rapid growth. These young seedlings are then either sold or transplanted for further cultivation. Most of them are sold to the other big nursery centre of Europe, Halstenbeck in Holstein, who transplant them and sell them as four years old. The soil in Holstein is very sandy without rocks. The country is flat and very easily cultivated. For miles and miles you can drive through nurseries all cultivating young forest trees, hedge-plants and roses. The ground is very valuable, and divided into a number of small nurseries. On account of the valuable ground, the nursery owners are obliged to transplant their young trees with exceedingly close spacing, often with not more than three inches between the rows, and one inch between the plants in each row, thereby forming a plant of a very stringy appearance. In order to push the plants from this sandy soil, the nurseries are using a great amount of fertilizers, often, per acre, a thousand pounds of superphosphate, four hundred pounds of kali, and six hundred to a thousand pounds of chili-salpeter. These nurseries in Holstein have also big seed-beds, especially of conifers, but as a rule the seedlings are made in France, Belgium and Holland and are transplanted in Holstein. From these two plant centres is supplied nearly the whole world. Immense quantities have been sold to England and to the United States. In Denmark, Scandinavia, and Germany, a forester who has to buy plants from the nurseries is looked upon as a failure. It ought to be the same here in Canada.

Suppose you buy seeds from the mild misty climate of Norwegian fjords or from the super-cultivated marshes of Holland or Belgium or from the Baltic shores of Northern Germany or plants which have passed their first stage of life in the hot beds of Holland or Belgium, or in Holsteins sands, unnaturally fed on fertilizers, and transplant these in your nearly Arctic climate, in your dry inland air, what result do you expect? In those nurseries, all kinds of fungi and parasites are in abundance. You have already imported the white pine blister rust. If you buy plants to any extent from Europe, you will import all kinds of diseases, both fungi and insects. You will not advance the cause of Forestry in that way. Allow me, in this connection, to point out that you have been importing a number of white spruce seeds and plants from Europe, especially from Sweden.

The mother tree is *Picea alba,* a species of spruce very inferior to your beautiful *Picea Canadensis.* The tree, *Picea alba.* originated from North America. It was imported to Europe about the year 1700. It has degenerated to a small poorly-tapering tree, which is never used except as a wind break.

In forestry, as in farming and stock-raising, the hereditary principle is of great importance. A tree from a coast climate will not thrive in an inland climate. In Europe, we have seen, that if we try to force nature, by planting trees in climates where they are not at home, they will be destroyed by all kinds of parasites. In Denmark, which has a coast climate we imported Austrian Pine from the inland climate of Austria, and planted it in great quantities on the moors of Jutland, thousand of acres. You will now hardly find one acre with Austrian Pine. They have all been killed by *Lophodermium.* We planted thousands of acres with larch (*Larix Europea*) from the inlands of Europe. They were all killed by larch cancer (*Dasyscypha Willkommii*). It seems that the later imported Japanese Larch (*Larix Leptolepis*) from an island climate will go free of the parasite. We tried your white pine, they are all killed by blister rust (*Cronartium ribicola*). We have imported *Pinus Murrayana* and *Pinus Contorta* which in reality are the same specie (lodgepole pine) the former growing on the coast of British Columbia, the latter on the other side of the Rocky Mountains, in an inland climate. The first thrives well the latter is killed by *Lophodermium,* and a moth (*Tortrix buoliana*). I could continue naming examples showing the importance of this question.

The best thing for Canada to do is to collect its own seeds from its own trees, from the same locality where the trees are to be planted or seeded, but collect them from the finest and best specimens of the race. Try to improve your poor race of Black Spruce; avoid cultivating your poor race of Grey Spruce; collect seeds from White Pine which show the strongest resistance to blister rust. In other words, select your seed-trees with the utmost care. You will thereby avoid making all the mistakes we have made in the old country.

Hoping that this article may prove of interest, I remain,

Yours truly,
OTTO SCHIERBECK.

Can. B.C. Forests Stand Coming Strain?

By R. W. Hibberson

(for 17 years a British Columbia timber estimator and surveyor)

in an address before Associated Boards of Trade, Vancouver

Within ten years our coast forests may be subject to treble present demand

"To the average man in the street," said Mr. Hibberson, "British Columbia is all imbered. He travels by train through the interior of British Columbia, or by steamer up the coast, and everywhere looks green; therefore it must be timber. If you told him there is every danger of timber famine in British Columbia within fifteen years, you would be ridiculed. But there is a very decided danger of a timber famine, and before many years lapse we will all begin to feel it.

"Ten years ago the centre of the logging industry was within a radius of fifty miles of Vancouver. To-day it is from one hundred and fifty to two hundred miles from Vancouver, and in some cases operators are towing logs as far as six hundred miles to their mills, and an average tow of two hundred miles is quite common. Ten years ago the average cost of logging was $5 per thousand feet; today it is nearly $20 per thousand feet, and in some of our cedar camps last year the cost was over this fig-

"Nineteen-nineteen figures give lumbering production as $70,000,000, one-third as much again as mining and fishing combined, which only total forty-eight millions. There are many other industries dependent on the lumber industry. Our wire rope plants, iron works, food supply houses and farmers will all feel the loss. Our salmon canneries, mines and railroads are large consumers of lumber, and will keenly feel the loss of our timber, which will increase their operating expenses enormously.

Not an Alarmist.

"I have no doubt that you think I am painting a very harrowing picture and one that can never come about, but it has come about in other parts of this continent and will certainly come about here unless we can take measures to prevent it. The fact that we can ship lumber across the continent by rail into New York State, to keep the wood-using plants there alive, proves it. New York State once was heavily forested, like British Columbia. Her requirements today are 300 board feet per capita. She can only get from her forests thirty feet per capita; the balance of ninety per cent. she must import from Canada, the Pacific Coast and the Southern States.

"Less than five per cent. of the original forests of the New England States remain. The original pine forests of Michigan, Minnesota and Wisconsin, estimated to contain 350 billion feet, talked of as inexhaustible, are now reduced to six billion feet. These densely populated States are now dependent on timber grown and manufactured elsewhere, and in a very few years will be absolutely dependent on Pacific Coast timber.

"The bulk of the timber used in the Eastern and Central States during the past fifteen years was grown in the pine forests of the South, but these forests have been so heavily cropped that they have now been reduced from 650 billion board feet to 150 billion board feet. Much of this is small timber on cut-over land, and within seven years these States will cease to be a factor to reckon with in the export business, for they will require their timber for their own domestic use.

Can't Check Demand.

"We are only in our infancy as producers of lumber, but within five years the lumber business of British Columbia will have grown enormously. We should be cutting at least five billion of feet by 1926. The demand is coming, and nothing can stop it. It has now come down to a matter of mathematical calculation.

"Mr. A. L. Clark, president of the Vancouver Lumber Co., some time ago had courage enough to state that we had not nearly the amount of timber in British Columbia that we were credited with. He estimated our resources at approximately 150 billion feet. Dr. Judson Clark, a well known authority on timber in British Columbia, estimates the total stand of accessible merchantable timber to be approximately 100 billion feet. Personally, from seventeen years' observation and examination of the timber in British Columbia by our firm, I incline to the figures as given by Dr. Clark.

"Of the forty thousand square miles of commercial forest in British Columbia, only fifty per cent. can be seriously considered as containing accessible loggable timber, the balance being on rocky, steep ground, where the cost of logging and the breakage would be so great that it would not tempt a logger to operate for many years to come.

"The virgin growth of timber in British Columbia is steadily decaying and should be cut and marketed, but the young second growth, on which we depend for our future supply of lumber, should be jealously preserved. At present we are recklessly cutting it for tie timber, poles and mining timber, destroying fully thirty per cent. of it during the operation. It is common practice to leave twenty to forty feet of good, sound butt logs in the woods, because it is too large to hew into ties. The same condition applies to operations where mining timber is being logged. This should be checked and without waste of time. Depletion of our forests in British Columbia within twenty years, with a resultant slump in all enterprise that depends wholly or in part on forest products, can only be averted if action is taken without further delay.

"The action we would propose is that private timber land owners adopt logging methods that will protect and preserve young growth, and leave logged-off lands in condition for forest renewal; then the young trees of today will be of merchantable size when needed. This is dependent on keeping fires out of the forests, so that young trees will have an opportunity to grow.

Job for the Government.

"It has been shown on examination that unless logging slash is burnt over the reproduction is very poor, the heavy slash shading the young seedlings. It is necessary for a fire to follow logging operations in order to prepare the ground for seeding. This should be undertaken by the Government, which can take every precaution to avoid disastrous fires.

"It takes approximately 80 years to produce trees of commercial size that will make ties and piling for the Coast or saw logs for interior mills. Eventually our Coast mills will have to adapt their cutting machinery for small logs, for the virgin timber, once gone, can never be replaced. It takes from 200 to 400 years to produce our large fir timber, and double that to produce our big cedar. The fortunate owner of a tract of virgin cedar and fir will, if only he can afford to hold it for a few years, reap a rich reward.

"The reforestation will have to be undertaken, in the main, by the Government. It is not practicable to enforce the practice of forestry on private timber lands, for the growing of timber of saw log size is an operation too long in time and offering too low a rate of return to attract private capital, always excepting pulp and paper companies, who can use timber long before it becomes saw log size.

"The price of logs governs the price of lumber, and with the consumer demanding cheap lumber the millman naturally is demanding cheap logs. The logger, in order to get his logs as cheaply as possible, is devastating our forests, cutting only the timber that can be cheaply handled, smashing down all the smaller timber in the process of logging, and leaving in the woods, to rot or to be burnt, some thirty to forty per cent. of the volume of the timber on the ground. He cannot afford to attempt to log much of the timber on the high elevations or on the rough ground. Broken timber is left, and on most operations on rough ground fully half of the timber stand never reaches the mill, it being broken up and left on the ground.

Forest Devastation.

"There is no country in the world that would tolerate the wasteful logging methods practised on the Pacific Coast of Canada and the United States. It is not logging; it is forest devastation. Who are we to blame? The logger, in order to make a fair return on the investment and log all the timber on the tract, carefully taking off first all the small timber, and then logging the heavy timber, must have an increased price from the mill for his logs. Therefore the consumer cannot look for any cheap timber in the future, as the cost of operating is continuously climbing.

"We have been credited in British Columbia with having 350 billion feet of standing timber. Of this I have no hesitation in saying that there will not be 100 billion feet actually taken to our sawmills in the form of saw logs. This figure, of course, refers to our virgin timber. Our present output is approximately two billion feet per year: this figure will be more than doubled within five years, and by 1930, British Columbia will be called upon to supply at least six billion feet per year, possibly more.

"As is well known, the Eastern United States is almost denuded of timber. Americans are already dependent on Eastern Canada, the Southern States and the Pacific Coast for ninety per cent. of their domestic requirements in lumber. The Southern States, which now cut approximately twelve billion feet per year, will, within seven years, cease to be an exporter of lumber, and the Pacific Coast will be called upon to supply the deficiency.

Prepare for Famine.

"Already the people on the other side of the line are preparing for a timber famine. Reforestation is practised in many of the Eastern States. The pulp and paper companies, which formerly were self-supporting in pulp timber, now obtain eighty per cent. of their pulp and pulp wood from Canada, and if, as is quite probable, Canada prohibits the export of pulp wood across the line, most of these companies will be put out of business, and investments totalling hundreds of millions of dollars will be wiped out.

"In British Columbia, in the Coast district, we waste most of our small timber. Hemlock 12 to 20 inches on the stump is not considered to be worth logging. In almost any logging operations on the Coast you will see the small hemlock left on the ground, literally on the ground, for the high lead method of logging breaks down practically all the small timber on the tract, and when the operation is completed it reminds one of a scene in a Belgium forest after it has been devastated by the Huns.

"The average timber license on the Coast carries approximately twelve million feet of timber; the average amount logged off a timber license during the past fifteen years is five million feet. Government licenses have logged as high as eighteen million feet, but a great many have only yielded three and four million feet.

"Only the timber on the lower elevations has been logged off, the balance being left a prey to fire and wind storms which every year claim millions of feet. What is the remedy for this? We cannot force the logger to take off this lumber if by doing so, he cannot make a profit. The average consumer of lumber says he cannot afford to pay fancy prices for lumber in order that the timber can be protected and logged clean. But what will be the ultimate result if we do not stop this waste? Our virgin timber gone, all our wood working plants, or the majority of them, will be forced to close, and, as lumbering is the chief industry of British Columbia, we shall suffer a great loss.

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A heavy litter of logging debris—a natural incubator of destructive fires.

Effect of Forests on Flow of Streams

THE evidence in support of the contention that forests exercise a distinct and beneficial influence upon stream flow and springs is gradually accumulating, and it seems that what was at one time little more than an improved theorem is assuming the status of an ascertained and well-proven fact. The theory has in the past been seriously disputed, or has been accorded only a tentative and guarded acceptance. But a careful examination of the conclusions, and the reasons for arriving at them, of those who declined to commit themselves to definite acceptance makes it clear that most of the dissentients had arrived at a decision from a consideration of purely local conditions, and had not made themselves fully conversant with the results of long and careful observation elsewhere. Strangely enough, foresters of the first half of the nineteenth century, few of whom employed methods recognized as sufficient by scientific investigators, were, take them all round, more inclined to adopt the theory that forests do influence climatic conditions and the flow of water than were those of the second half of the century. The modern forester, however, if he does not arrive at a definite standpoint, brings an open mind to bear on the matter, and is ready to receive and weigh evidence that is satisfactorily supported. And, speaking broadly, foresters throughout the world at the present time, with few exceptions, admit that forests have very important functions in the matter of precipitation and conservation of water, and they examine eagerly all proofs that are advanced when the observations on which they are based have been conducted on strictly scientific lines.

French Experiments.

France, more than a generation ago, conducted an investigation into the matter, and the results, as published, strongly confirmed the view that between forests and precipitation and water-flow there is an intimate connection. And now the results of another investigation have been made known. In 1900 the Swiss Engineering Station at Zurich undertook an investigation, using two watersheds in the adjacent mountains as the scene of their operations, and making their experiments in accordance with the strictest scientific requirements. The work covered a period of eighteen years, and it will be of interest to state here the deductions from the Swiss observations that seem to be of general application.

One general fact that has been confirmed by the Swiss experiments is that a good forest cover has a very beneficial effect upon the regime of streams in mountains and hilly country. Another fact confirmed was that streams fed from a forested watershed have a more uniform discharge and carry less debris into the larger rivers to

Once get an area like this thoroughly dry and no army of fire rangers could save the surrounding timber from ruin.

which they flow than streams coming from an unforested watershed.

The Swiss experiments have conclusively shown that extensive damage from floods occurs less frequently in streams coming from forested watersheds than from streams rising in poorly forested or treeless watersheds. This is, of course, an absolute guarantee against the power of the elements.

The great importance of forests in hills and mountainous regions in feeding springs has been proved beyond a doubt in the Swiss experiments.

In general rains of variable intensity the forest cover showed a tendency to retard the amount of run-off. It was proved that the porosity and lightness of forest soil are brought about by the protection furnished by the tree crowns, by the formation of leaf mould, and by the presence of living and dead roots and an abundant soil fauna. Forest soil, it was ascertained, is much more permeable to water than unprotected soil. It was deduced from the experiments that the whole explanation of the favourable effect of forest cover upon stream flow lies in the greater porosity and permeability of the forest soil.

From Switzerland.

The Swiss experiments have discounted the opinion long held by many prominent investigators that the great water-retaining power of the forest soil is due mainly to the great receptive capacity of the leaf litter and moss cover. The experiments have conclusively shown that raw hum and moss cover have had a very unfavorable effect upon the water regime. Many evidences of damage from floods in forested regions could be directly traced to accumulations of raw humus in the forest.

The results of the Swiss experiments are fully embodied in a publication written in German and issued in 1919 in Zurich.

In this connection it should be stated, too, that in 1910 a similar project was instituted by the United States forest Service, in co-operation with the Weather Bureau in the North Rocky Mountains at Wagon Wheel Gap, Colorado. The results of these experiments are not yet published, but are expected to be made known soon, and a comparison of results obtained in Western America with those furnished by the Swiss investigators will be of the highest interest to foresters.

Loading Lumber Long Ago

C. F. S., in Punch.

If I'd got to choose alone
One of all the freights I've known—
All my cargoes live and dead,
Bacon, pigs and pigs of lead,
Cattle, copra, rice and rails,
Pilgrims, coolies, nitrates, nails,
Lima beans and China tea—
What do you think my pick would be?

If I'd got to name the best—
Take just one and leave the rest
Out of all the ports I've known—
Coral beaches white as bone,
All the hot lands and the cold,
Nights of stars and moons like gold.
Tropic smells and Spanish wine,
Whispering palm and singing pine,
All the isles of all the sea—
Where do you think I'd want to be?

Loading lumber long ago
In a ship I used to know,
With the bow-ports open wide
In her stained and rusted side,
And the saws a-screaming shrill
At the Steveston lumber mill;
Where the Fraser floods and flows
Green and cold with melting snows,
And the tow-boats' wailing din,
As the booms come crawling in,
Fills the echoing creeks with sound,
And there's sawdust all around,
Deep and soft like drifted snow;
Nowhere much a man can go,
Nothing much to see or do,
Mouldiest burg you ever know.

But I'd give the years between—
All I've done and all I've seen.
All the fooling and the fun,
All the chances lost and won,
All the memories sweet and sad,
Far and near, by shore and sea,
I would give them all to be
Loading lumber years ago
With the lads I used to know—
Loading lumber all day long
Stacks of scented deals among—
Loading lumber at the mill
Till the screaming saws were still
And the rose-red sunset died
From the mountains and the tide,
Till the darkness brought the stars
And the wind's song in the spars
Of that ship I used to know—
Loading lumber long ago.

The Economic Significance of Forestry

By Gifford Pinchot, formerly Chief Forester of the United States

CAN we look to the rest of the world for material help when American forests fail? To our very serious danger, we can not.

The destruction of our timber, and of the timber-producing power of lands valuable for no other purpose, would be far less serious than it is if there were other portions of the world from which the absolutely essential lumber supply for our agriculture and industries could be obtained. From the point of view of the gigantic needs of the United States, Canada has no great supply of lumber, and has already made it plain beyond peradventure that she purposes to keep what she has for her own development. Mexico even if the merciless exploitation of her remaining forests were permitted, could not supply us long. South America, with enormous resources of hard and heavy tropical woods, such as we use for cabinet purposes, has comparatively little suited to the needs of our industries and our people. The story is the same throughout the world. Africa, Australia, Russia, Siberia, the Phillippines and the islands of the sea offer us small relief.

Moreover, he would be a poor American who in the face of the lessons of the Great War would suggest that the United States should depend upon overseas transportation for an essential without which neither her agriculture nor her industry can survive.

We must raise what we need, or go without. Take Pennsylvania for an illustration. The industries of the Pittsburgh district alone require more timber than the total cut of the whole state. Pennsylvania, once the first timber-producing State of the Union, now cuts from her forests only one-fifth of her own consumption, and is

Ontario's "white coal" supply involves the careful protection of the watershed forests.

reproducing in new growth only one-third of that. The industries of the State therefore can go on only because the indispensable supplies of forest products can still be secured from other states at prices not yet entirely prohibitive. When these supplies fail, as they will, or when the cost of importing lumber rises too high, the industries of Pennsylvania will pay a bitter price, and the question will be no longer whether they can prosper, but whether they can survive. In that day the decision will depend on whether or not Pennsylvania has taken in time the necessary steps to raise at home the timber she must have and cannot get elsewhere.

As with Pennsylvania, so with every other deforested or unforested State in America. The exhaustion of forest supplies will threaten and very possibly destroy the life of its agriculture or its industries. It is no more than the truth to say that the forest question is vital.

What has brought this dilemma upon us? Two things: fire and destructive lumbering. These two working together have either cut down or utterly destroyed the productive capacity of vast areas of forest lands—lands which in large proportion are valuable for nothing except to grow trees and never will be, or which at this stage of our economic development are unavailable for agriculture and must produce timber or nothing.

Like the trouble, the remedy is two-fold. We must put an end to forest fires, and we must save the productive capacity of the virgin forest lands we have left. Thus we shall give the lands which are already cut over, and those which are yet to be cut, at least a chance to serve the Commonwealth by producing wood, and we shall keep lands good for nothing else at work growing trees.

Upon the continued productive capacity of the remaining virgin lands we must chiefly depend to bridge the gap between the time when what forests we still have shall be substantially exhausted, and the time when the lands now culled, cut, burned and devasted may be expected to recover their power to produce. This is the first problem, and the key to success in American forestry.

Privately Owned.

Sixty-one per cent. of our remaining timber lies west of the great plains. Half of it is in the States of Washington, Oregon and California. By far the larger part of it is in the hands of private owners. So far has the concentration of ownership gone that one-half of the privately owned timber in the United States is already in the hands of two hundred and fifty owners, and this dangerous concentration, will, in the language of the United States Forest Service, "steadily increase as timber depletion continues, approaching a natural monopoly in character, and this control will extend particularly to the diminishing supply of high-grade material."

What is needed, then is to prevent the owners of commercially held timberlands, still uncut, from obliterating, by destructive methods of cutting, the power of their lands to keep on growing trees. For more than a quarter of a century argument and persuasion have been employed in vain. The time has come when the nation can no longer trust to the lumbermen, who have got us into this trouble, to pull us out. We know they hold the belief that their immediate pecuniary advantage lies in forest destruction, and that (with honorable exceptions) they are living up to it in practice. We cannot safely leave to them the decision as to whether our agriculture, our industries, our transportation, and the comfort, safety, and welfare of our whole people shall be protected or shall be exposed to the unthinkable miseries which must accompany a famine of one of the basic materials of our civilization.

The lumbermen have not ceased from forest devestation, although the danger to the community has been abundantly demonstrated. They will not cease from it until they are compelled. The strong hand of the community, and nothing else, can prevent the devastation of the uncut lands which remain.

Public opinion is just awakening to the vital need for the practice of forestry on private timberlands held for commercial purposes. This awakening, far more purposeful and wide-spread than the similar stirring of public opinion which made it possible to secure the national forests, offers the most promising opportunity for progress in American forestry within my experience. There is clearly before us the chance for a greate advance, an advance which may even extend within the next decade to the point of assuring a permanent and sufficient supply of American forest products.

The chance is here, but we have not yet made use of it. We must crystallize this invaluable public opinion behind a policy wise enough and strong enough to make us independent for good and all of timber supplies from other countries. Our success in doing so will depend on two or three essentials in the policy behind which the forces of forest conservation elect to throw their strength. The first of these is that we must work with and not against the underlying trend of the times. The second is that we must present a policy which can be adopted, and which when adopted will produce results.

The policy we decide on must be submitted for the approval of Congress, a national body whose members are necessarily governed not only by the interests of the Nation at large, but more particularly by the interests of the individual States which they represent.

The essential facts in the lumber situation so far as the selection of a national forest policy is concerned are three: first the United States is not self-supporting in timber, but is consuming its forest capital four times faster than that capital is being renewed; second, not only timber but the productive capacity of timberlands is being destroyed; third, the great majority of the States are unable to supply their own needs for wood, but must rely upon the forest resources of other States. Therefore, the agriculture and industries of most of the States are dependent for their essential supplies of lumber on forests outside of their own boundaries. As to a majority of our Commonwealths, this condition will be permanent.

Forced to Import.

It may be taken as basic, therefore, that the majority of the States, containing the larger proportion of the American people, will be permanently dependent for their prosperity on timber supplies produced outside of the boundaries of the States in which they are consumed.

Ontario's Self-Renewing Gold Mine

AT a very largely attended banquet of the Associated Boards of Trade of Temiskaming, held at Cobalt, Ontario, under the able chairmanship of Mr. R. A. McInnes, general manager of the Abitibi Power and Paper Company, Mr. Robson Black, of the Canadian Forestry Association, delivered an address, touching particularly upon the timber and pulpwood resources of the north and the important part they were playing in the expansion and activity of the hinterland. Mr. Black reviewed briefly the part played by the forest resources as a contributory factor to all constructive activities in the Dominion of Canada. It was impossible, he said, to operate the Canadian railways without twenty million ties for replacements each year, or to run even one telegraph system without fifty thousand poles for maintenance, or to lift from a soft coal mine one ton of coal without first putting into the mine seven lineal feet of wood for pit prop purposes. The service of the forest extended in an equally significant way to the fisheries and manufactures. "I am purposely putting into the background" said Mr. Black, "the direct utilization of forests in such substances as pulp and paper and lumber in order that we may see that if we kick out the forest-prop we not only destroy forever the wood-using industries, the towns they have built up, the vast army of their employees, but we also put beyond reach the unreplaceable materials essential to agriculture, manufacture, stock raising, fruit growing and the maintenance of life itself in this northern climate."

Timber Growing For This Land.

The speaker asserted that timber growing was the sole purpose to which over 80 per cent. of the entire area of Canada can be devoted. Of New Brunswick and Nova Scotia about 70 per cent of the total land area is non-agricultural. Even in such a prairie province as Saskatchewan fully two-thirds is a natural forest estate and useless for agriculture. Of Quebec's 250,000,000 acres, including Ungava, only about 15,000,000 acres have been put into farming and the relative position of forest land and farm land will never be seriously altered. In Ontario, more than 60 per cent. is non-agricultural and fit only for the production of timber crops.

The creed of forestry, said the speaker, is to cultivate on each acre of land the crop for which it is best adapted. If expert examination shows a township to be of good agricultural soil, let us devote that township to the annual crops of cereals, grasses or vegetables. If non-agricultural, it is the part of common sense to insist upon it producing something for the public welfare. In other words, what is unfit for farming should be made to produce timber, which, particularly in this day, is the incubator of pulp and paper and lumber industries and through them of new towns, new markets and a long chain of other important benefits. The development of the farm and the development of the forest should have no point of collision. In the kind of land each desires there is no antagonism or overlapping. On the contrary, the development of forest industries from the timber crops of non-agricultural lands supplements and stimulates the agricultural industry carried on in parallel areas. There is not a forester nor a progressive lumberman or paper manufacturer who would propose that good farm land should be retained permanently under timber.

Our Bush Whacking Process.

The speaker gave strong emphasis to the fact that, taking Canada as a whole, the bush-whacking process had gone to tragic lengths. We have more acres that have been cleared of trees and must be got back under timber in order to pay a profit than we have acres now covered with timber that can ever profitably be cleared for farming. A million square miles of Canada have been cleared of timber by the effect of forest fires on little of which a farmer will ever run a plough and make his salt. In the wake of forest destruction has come not an army of farmers—except for a few localities—but a howling wilderness in which the chimney smoke of the wage earner is never seen and not even the fur bearing animals can scrape a living.

"Month after month the ugly menace of forest exhaustion closes in on the newsprint mills of Eastern United States but the ill wind of which Uncle Sam complains has proved a 'trade wind' to the argosy of Canadian pulp and paper manufacture. From a petty cargo of $120 in value shipped to Uncle Sam twenty years ago, the Canadian paper mills put over the border last year $120,000,000 worth of pulp and paper. Uncle Sam pays more for the things that come from the Canadian forest, than for all other manufactures combined. Bare exports alone have the lifting power of $400,000 a day in keeping exchange even where it is. Without newsprint cargoes running south across the border, United States exchange would almost strangle Canadian trade.

No Surrender of Our Timber.

"A few years ago our pulp and paper towns were all a piece with the silent wilderness. To-day we find them athrob with industry. It is one of the dividends of the forest possessions, the inevitable harvests accruing to any country that can show the world the powerful triumvirate of pulp forests, plus water powers, plus railway facilities to a near market. Not many lands have got that combination; many had, but have no longer. Northern Ontario is the present possessor of this mighty industrial magnet and from the point of view of the American business man, who sees our possessions and potentialities, perhaps in truer prospective, if we ever were commanded by some supernatural power to give up one of our natural resources we were better advised to surrender our mines than to surrender our forests. There is no need for doing either, let us hope, but it does not indicate any animosity toward the great mining industry to point out that a mine is a non-reproducible form of wealth and inevitably must face extinction while the forest, like the farm, bears a reproducible crop, giving of its wealth to-day and capable of repeating its contribution again and again and again.

"The basic difference between the extraction of forest crops cannot be stressed too much. It is true that the forests have often been treated as a mine but we are now at the edge of a new dispensation. Forest mining must cease and every area of forest on non-agricultural soil, so treated that while the axe cuts out a present crop for the use of the mill it also cuts the pattern of a future forest. Pulp and paper industries with their organized forestry departments are determined in self defense to anchor the forest as they have anchored the mill dam, to separate their timber tracts, so that any future lumbering and pulp and paper making need be no more itinerant in character, with itinerant towns and shifting population than is true of the growing of oats and turnips."

"In the head office of insurance companies may be found a card index machine of such marvelous ingenuity that when an inspector wishes to see at a glance any class of policy holder of any age or place of residence, all that is necessary is to press an electric button and the information is instantly delivered. Press on button and out come all the New Brunswick farmers, age 55, whose endowment policies mature in five years. Press another and you get all the Canadian plumbers, age 37, who are carrying $100,000 or over. Each card runs back to its nest and comes to hand again whenever desired. It is not possible that our eagerness to look over the cards of farming and mining in Northern Ontario, we have neglected to swing into public view once in a while the well furnished tray of forest assets and forest industries and forest employment?

"I have said, there is no antagonism between the job of growing forests and the job of growing farm crops. The first asks only the square mile that the other cannot utilize.

Spruce Forests—What They Mean.

"As long as free land was available near the railways of the prairie provinces, Northern Ontario was halted in its development and even yet the rivalry of the bare prairies must be felt for many years to come. Similarly, when the forests of the United States seemed to be abundant for all time to come, development of forest industries in Northern Ontario was pretty well limited to the lumber trade. Only when the threat of forest exhaustion was combined with an enormous increase in the use of newsprint on this continent, were the spruce forests of Northern Ontario translated, as under a magic wand, into great factories and armies of employees. To-day the forests of Northern Ontario stand as one of the supreme prizes of the North American continent.

Mr. Black reinforced this point by outlining the grave crisis which the newsprint and lumber industry in the Eastern United States now faces. Three thousand mills in the Southern States were certain to go out of existence within eight years because of forest exhaustion. President Dodge of the International Paper Company recently declared that in the Eastern States there were not enough spruce areas on the market today to justify the erection of two fifty ton pulp mills.

Apparently safe but he did not build on the presence of an Alberta cowpuncher and a handy lariat which brought him to earth angry but uninjured. The photo was taken near Banff, Alberta.

A Sky Patrol for Fire Detection

By Luther K. Bell, Manufacturers Aircraft Assoc., New York

THROUGH the operation in 1920 of a few aircraft lent to the Forest Service by the United States Army, there was saved from destruction by fire standing timber valued at more than the total Army Air Service appropriation for the fiscal year 1920-1921, or approximately $35,000,000. Between 900 and 1,000 fires were reported, most of which were extinguished by ground forces directed from the air.

The operation of the experimental aerial forest patrol service which the U.S. Army Air Service maintained during the summer of 1919 in conjunction with the Forest Service proved sufficiently successful to warrant its development.

Plans for the work to be carried out in 1920 were formulated at a conference at March Field, Riverside, Calif., between representatives of the Air Service and the Forest Service. As a result the organization of the Aerial Forest Patrol was so modified as to make it an integral part of Forest Service activities, though still operating under the direction of the Army Air Service.

The importance of adequately protecting our timberland against fire can be appreciated from statistics compiled by the Department of Agriculture, which show that some 10,000,000 acres of standing forests are burned each year. As the entire forest area of the United States is 463,000,000 acres, it follows that, at an average of 10,000,000 acres destroyed annually, our timber resources will not last long. The problem is further complicated by the ever increasing use of lumber and of pulp in the manufacture of paper and also by the fact that we have always used more timber than we have permitted to grow.

The Department of Agriculture estimates that 100 airplanes in daily service would keep the Pacific Coast forests safe from fire, an area which contains 52 per cent. of all the timber in the United States. As fires destroy approximately $20,000,000 worth of lumber each year, not counting the damage done to private property, the eagerness of the Forest Service to be permitted to use air planes is readily appreciated.

During the summer of 1920 the airplanes of the Army Air Service principally patrolled the national forests of Oregon and California.

Safety to Personnel.

The entire Army personnel was in charge of Captain Lowell Smith stationed at Eugene. A Forest Service representative was also stationed at Eugene, who acted as a liaison officer between the Air Service, the Forest Service, the State Forester, and the private owners. Each plane was nearly always in communication by wireless with the main or sub-base. The northern patrol covered daily a route of 360 miles and the western patrol from Eugene covered 326 miles, each with one landing for fuel and oil. A total of 719 fires were discovered and reported during the summer by the Oregon aerial patrols. Two forced landings were made, resulting in serious damage to the planes, but causing no injury to the occupants.

The California airplane patrol of the national forests started about June 1st, 1920. Headquarters were located at Mather Field, near Sacramento. Practically all of this work was carried on by the 9th Aero Squadron, Army Air Service. It was divided into detachments and these detachments were located as follows: one at Fresno and one at Mather Field. Each detachment consisted of about 25 officers an dmen.

Three patrols were operated out of Red Bluff; one went to Alturas and return, covering Mt. Lassen, the east half of Mt. Shasta and the Modoc region; the second to Montague and return, by way of the Coast slope, covering the west half of Shasta, the Klamath and the Trinity regions; while the third covered the California Forest, by way of Vovelo and Lakeport.

Two patrols operated daily out of Mather Field. One flew to Red Bluff, covering the north half of the Eldorado, Tahoe, Plumas and part of the Lassen forests; the second to Cooperstown, covering the south half of the Eldorado and the Stanislaus. Two planes were operated out of Fresno each day, one flying north to Cooperstown, covering the Sahara, Yosemite National Park and the Stainslaus Forests; and the second south to Bakkersfield, covering the south half of the Sahara and the Sequoia forests.

The March Field detachment protected

the entire southern part of the state. One patrol covered the Angeles and Cleveland Forests, landing at San Diego, and the second flew north to Santa Barbara.

At each base a liaison officer was located. This officer in each case was an experienced forester, detailed for this special work. All matters in connection with airplanes patrol out of each base in question were taken up with and through this officer, who also acted as a clearing house for all fire reports. At each base the liaison officer received fire reports by radio or from the pilots after landing. He in turn transmitted the report to the Forest Supervisor.

Proof of Efficiency.

Paul G. Redington, Forester in charge of the California district, states that 33 per cent. of the 196 forest fires discovered and reported by that part of the 9th Aero Squadron operating out of Mather Field this year, were accurately located. "And 'accurately,'" said Mr. Redington," in this case means that these locations given us by the airplane fire patrols, were all within one-fourth mile of the exact location as later determined by actual surveys on the ground.

"This record, when supplemented by the further facts that an additional 19 per cent. of the fires discovered were reported within one-half mile of their actual location, that 10 per cent. of the total numbers were discovered by the air patrol before the rangers knew they even existed; and that 42 per cent. or 83 of the fires were reported by radio, while the ships were in flight, demonstrates without a doubt that airplane fire patrol in California has been successful.

"Besides acting as lookouts to detect and report fires, airplanes were used this year to direct fire fighting operations and to patrol fire lines which have been established, but which needed watching to see that the flames did not get beyond control. The case of the Mill Creek forest fire, on the Lassen National Forest, where 25,000 acres were burned over, is an example. Here a special reconnaissance plane equipped with radio and with a forest officer for observer, hovered over the fire and actually directed the movement of bodies of forest fighters by wireless messages received right on the fire line. In addition this plane patrolled twice each day some fourteen miles of completed fire lines, from which all men had been removed. If reports from the air showed the line to be clear, the fire fighters were kept at work elsewhere, but if the observer wirelessed in that the fire had broken away, then a force of men was rushed to the spot and the fire corralled again."

The Use of Wireless.

At each base of operations of the airplane forest patrol there is a sending and receiving radio set and a wireless telephone attachment. There are also maps, covered with bright-colored pins. For every fire reported a pin is inserted in the correct location. When the fire is a day old a pin of a different color is put in its place. When the fire is extinguished the pin is exchanged for one of black. Fires reported from other sources than the forest airplanes are marked with another color pin. Thus the map is an up-to-date and accurate history of the season's airplane patrol.

During August the height of the forest fire season, the air over the Oregon forest was filled with smoke to an altitude of 11,000 feet. The pilots were compelled to fly at least 12,000 feet in order to be able to look down through these smoke screens. While ordinarily able to detect a fire and accurately locate it for a distance of forty miles where there is much smoke, the observers' vision is limited to within twelve miles.

But if the observer in the airplane is handicapped by the dense clouds of smoke that drift up from the blazing forest, the lookout on mountain tops and at the head of ravines, is rendered helpless. He cannot locate a fire accurately, and in many instances cannot detect another fire springing up in a new area.

Reconstructed DeHaviland planes equipped with Liberty motors were used on the aerial forest patrol. While on patrol, the planes are throttled down to a speed of 100 miles an hour. Each plane is equipped with radio set, and at each base a receiving set is installed, with capacity of receiving up to within 100 miles under good conditions. There was considerable difficulty with the first radio set installed on the planes. The Air Service finally supplied sets which operated successfully, and the patrols were kept in constant communication with their base and with each other. This successful operation of wireless made unnecessary the use of carrier pigeons.

Chewing Gum Costs More Than Forestry

To any Canadian who protests that the allotments of money for forest protection by any Government or private interest appear excessive, let him consider some of the bills the Canadian people cheerily pay for their every-day luxuries.

As against $1,750,000, which is the total spent on forest protection throughout the Dominion in even a year of serious conflagrations, place the following annual expenditures supplied to the Canadian Forestry Magazine by the Dominion Bureau of Statistics:

Canada's Yearly Bill.

Candy	$50,000,000
Cigars, Cigarettes and Tobacco	61,000,000
Soft Drinks	28,700,000
Jewellery	9,300,000
Chewing Gum	3,688,000

We spend on face powder and perfumery. $1,000,000. The bill for ice cream cones for juvenile Canadians is larger than the total amount spent on all forms of forest protection and forestry in the province of Ontario.

The national bill for cigarettes alone is over $23,000,000, and for cigars over $12,000,000.

When any complaint is heard that the nation is paying too much for the maintenance of forestry branches, let it be considered that all such expenses bulked together barely come up to the national outlay for the single item of chewing gum.

Quebec's Timber Stands Valued at $600,000,000.

This estimate, prepared after a careful study of the reports made by explorers, cruisers and forest engineers, is based upon the actual lumbering methods for exploitation. It takes in only such timber as is merchantable and neglects totally the young stock:

The Forest Wealth of Quebec.

Species.			
White and red pine	3,750,000,000	cub. ft.	$200,000,000
Spruce, balsam, hemlock and other coniferous, except cedar	15,625,000,000	,,	250,000,000
Cedar (Arbor vitae)	2,500,000,000	,,	25,000,000
Pulpwood	12,500,000,000	,,	100,000,000
Hardwoods	4,375,000,000	,,	25,000,000
Total			$600,000,000

From the standpoint of the pulp and paper industry (that is, considering on all accessible forest lands, either privately owned, leased or unleased, the trees such as spruce balsam, poplar and aspen of 4 in. in diameter and over, which can be manufactured into pulp and paper), the Quebec forests, according to Mr. G. C. Piche's estimate, would contain 360,000,000 cords. Of this quantity about 155,000,000 cords would be really available.

The Joy of Planting a Tree

Peter Lund, Lethbridge, Alberta

WHEN a boy, four years of age, I resided with my grand parents in a small village in central Scandinavia, and one day accompanied my grandfather into the adjoining forest for the purpose of gathering dead branches and fagots for the coming winter's fuel. On our return home I insisted on taking with me a real live tree. Whereupon the venerable grandfather dug up, roots and all, a young seedling, an infant Norway Pine. On our arrival home it was planted with the usual attendant childish ceremony and pride, I owned a forest of my very own. The tree was planted in front of the little abode house, with its thached roof, near the well. Later the wood fagots were hauled from the forest and carelessly thrown on top of my "forest" because of which came the usual childish lamentation. Two years afterward the wood pile became low, and behold my tree appeared, vigorous, healthy and strong, in spite of the apparent neglect. My childish prayer for the safety of my forest had been realized. The following year my mother, myself and two younger children sailed for America to join my father who had preceded us. About 15 years later the aged grandparents followed and brought with them a photo of the old home—and low and behold, my tree had grown into a mighty pine, its branches spreading across the whole front of the house, its height far above the chimney. Imagine my joy. My tender little plant had grown into a mighty Norway Pine, spreading its protecting arms, full of endurance, life and strength over the now dead and decaying domicile that had sheltered me when a little child.

In front of a modest home in the city of Spokane, Washington, I planted two small cherry trees 30 years ago. These two trees have now grown so large that during the flowering season scarcely a glimpse of the house and premises behind them can be obtained. My father now resides there. In the spring he lives under a bower of white cherry blossoms and later in the season, under a shower of golden, luscious fruit. But these trees do not belong to us, their beauty and grandeur is the common heritage of all passers by. But greater than all is the joy because of having planted them—I was the instrument used by the great Master Mind in bringing about their existence.

There is something enduring, substantial and vigorous connected with the forest, in fact, it is a part of our physical existence. Every living creature seems to have a natural desire to hie itself to a woodlands whenever possible. Human existence on our great Canadian prairie would be very nearly impossible without timber, and very few people would care to remain here if it were found impossible to grow trees. Trees for shade and shelter are necessary in the dry area, in order to hold and retain moisture and prevent the soil from drifting. Forest growth is also necessary on our watersheds, along our rivers and streams and at their heads, in order to control their flow and provide a steady and uniform supply of water for irrigation in the irrigated districts.

The Canadian Forestry Association is the instrument through which reform can best be accomplished. I hope before many years have lapsed that every business man in the Dominion of Canada, of whatever vocation, trade or profession, will be an active member of this Association.

The B.C. Forest School.

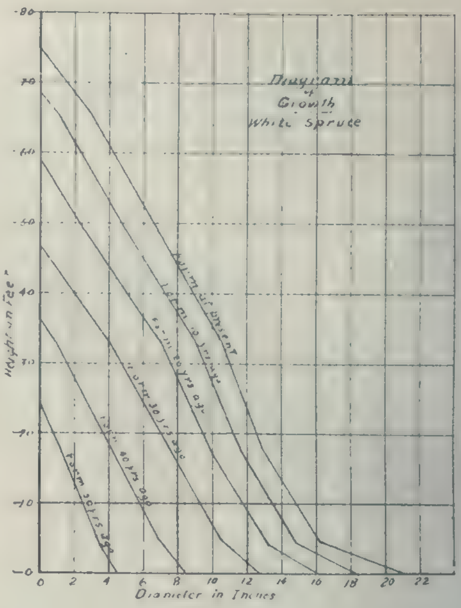
At the new Department of Forestry in the Faculty of Science, University of British Columbia, under Prof. H. R. Christie, a five-year course will be given, during the first two years of which the instruction will consist of general arts and science subjects, as in the courses in chemical, mechanical, mining and civil engineering. During the last three years, the student will specialize in forestry, this being definitely recognized as a branch of the engineering profession. Prof. Christie was for a number of years in the British Columbia Forest Branch, also with the Canadian Engineers in France. He is a graduate of the Faculty of Forestry, niversity of Toronto. The establishment of the new School of Forestry at Vancouver should mean much in the future development of forestry work in the western provinces, particularly British Columbia, which has had to bring her forestry experts from outside the province. The existence of progressive forest faculties is largely responsible for the progress of the forestry movement in Canada.—*Clyde Leavitt.*

The Record of a White Spruce

EVERY tree write its history as it lives. This white spruce grew on the north slope of a little knoll in the Agawa river valley in Ontario.

The casual visitor would not have seen any difference between it and the other spruces around it. It stood among spruces and balsams with scattered white birches to brighten the forest.

While the tree is about a hundred years old, it has grown to its position of command in the forest in fifty years, having made 98 per cent. of its growth in that time. Many trees of its age have grown larger but none were found that grew faster for the past five decades.



Money in Waste.

(BY JAMES D. LACEY.)

The problem of utilizing waste material is that of making its utilisation profitable. This problem is being rapidly solved, in the case of timber waste, by the work of chemists; for chemistry affords the chief key in this instance. The enhanced value of timber today is making profitable the conversion of waste into merchantable products—hence the activity of those who are studying those products. Not impossibly the by-products of the sawmill will outvalue, in the near future, the finished lumber. Alcohol, tanning extracts, turpentine, pine-oils, fibre for all sorts of fabrics, "wall-board," insulating materials—these are but a few of the products that may be obtained from sawmill waste formerly thrown away.

It is not altogether improbable that the time may come when the by-product distillates of wood will rank in value with the product of the co-ordinate sawmill operation. No one knows just when the production of petroleum may begin to fall below the tremendous and constantly-increasing demand for oil. Whenever a serious shortage sends oil prices above a certain point, however, ethyl (grain) alcohol distilled from wood will afford an efficient substitute for many purposes for which oil products are now used, including the operation of internal combustion engines for the automobile and other automatic machinery. Grain-alcohol may be produced from any wood at relatively low cost and by a process which yields other products of value as well. Wood-alcohol, produced by destructive distillation, is one of the pioneer by-products, but one for which the demand is increasing rapidly, both for direct use and to serve as a denaturing agent for grain-alcohol distilled for industrial use.

Relatively few of the important chemical by-products can be produced from any one wood. Tanning extracts, for example, are obtained chiefly from the bark of oak and hemlock. Turpentine is reclaimed from those woods possessing the necessary resinous content. Pine-oils, as the name implies, are produced from the pines. But chemical scrutiny demonstrates that practically every wood possesses important by-product possibilities that may be greatly magnified as experts explore further the field of organic chemistry.

During the war the range of by-products was greatly increased. In Germany fabrics of many varieties were developed and manufactured from wood. Wood-fabric rugs and carpets of serviceable character were produced. Bags and sacks, fibre silks, imitation leather, and many other articles of utility found market as substitutes for materials that were no longer obtainable. In the United States, too, recent years have seen remarkable development in the use of wood in manufacture of wall-board, an industry of great and growing size, and in the production of linoleums, heat-insulating materials, etc., thus creating important industries that are totally dependent on our forests for their primary raw material.

Progress is dependent upon the chemist's pioneer work, plus commercial development and exploitation that create demand and find markets. Until these things began to be done, the lumber manufacturer necessarily limited his utilisation to the conversion of his raw material into lumber and other primary products which he could make and sell with profit.

Much of this chemical pioneering has been done, but far more is coming, and as it comes it will steadily cut down the percentage of waste. Less of the tree will be left in the woods to rot. Less will be discarded as valueless at the mill. And a constantly increasing volume of other products than lumber will develop out of the sawmill industry, with resulting increase in the profits of sawmill operation and proportionate enhancement of the value of timber.

It is not unreasonable to suppose that eventually the value of chemical by-products may very nearly equal the value of the direct products of the sawmill.

Pennsylvania's Free Trees

The Pennsylvania Department of Forestry will distribute free this spring about 3,500,000 forest tree seedlings to private land owners in the State, according to a statement issued by Gifford Pinchot, the Chief State Forester. Last year 2,748,120 seedlings were given without cost to 792 private planters.

Since 1903, when the State nurseries began producing young trees, the total output has been 45,909,309 seedlings. About 34,000,000 of them have been planted by the Department of Forestry on State forest lands, and the remainder have been planted by individual land owners. Some of the largest plantations have been established by coal mining, water and lumber companies. Scores of farmers, however, have planted thousands of seedlings on waste and idle land that is not suited for growing agricultural crops.

The Department's supply of black walnut, white ash and Jack pine seedlings is completely exhausted. The output of Norway spruce and honey locust is being applied for in such quantities that it soon will be gone. There is available for future applicants, however, a large supply of white pine and pitch pine seedlings.

Conservation Commission Ceases

ACCORDING to an announcement contained in the Speech from the Throne at the opening of Parliament, it is the intention of the Government to abolish the Commission of Conservation, and to transfer its essential functions to the regular departments of the Government. The bill for the repeal of the act establishing the Commission had not been introduced in Parliament at the time when copy was being prepared for this issue of the Magazine. The Commission of Conservation was established in 1909 and has been engaged primarily upon educational work in connection with Forestry, Water Powers, Lands, Fisheries, Game and Fur-Bearing Animals, Minerals, Public Health, Town Planning and co-operating organizations.

The Big Job First.

"Keep public interest focused on the fire-prevention problem," writes P. T. Coolidge, Forest Engineer, Bangor, Maine, to the Forestry Magazine: "Do not let us get distracted by tree planting propositions or other work prematurely intensive. We want to save the reproduction that nature is giving us free."

C. R. Mills Appointed.

Mr. C. R. Mills has resigned from the forestry staff of the Commission of Conservation and has accepted a position with the Ontario Forestry Branch which will place him in charge of fire protection throughout the province, under the direction of the Provincial Forester. During the season of 1919, Mr. Mills was in charge of a working plan study on the limits of the Abitibi Power and Paper Company, under a co-operative arrangement between the Company and the Commission of Conservation. During the season of 1920, he was engaged, together with Mr. E. F. McCarthy, upon a similar project upon the limits of the Spanish River Pulp and Paper Mills, Ltd., north of Sault Ste. Marie, Ontario. This project involved financial co-operation between the Spanish River Mills, Ltd., and the Commission.

Research Possibilities of Wood Distillation

By Dr. Alfred E. Macintyre, Ottawa

(*Article No. 4*)

THE distillation of soft wood, spruce, pine, fir, etc., can be performed in the same apparatus as used for hardwood. The pit system, and modifications of this system, is largely employed in certain parts of Northern Europe and Southern Russia, while the retort system has found more general application in Central Europe.

Every part of the tree, including the roots, is distilled. While in general the same process of carbonization is utilized, some slight changes are made in the various operations, depending upon the species of wood and the character of its composition.

The destructive distillation of woods, rich in resins, is carried out in two stages. The soft wood is first subjected to a temperature of 250-400°F, whereby the turpentine and low boiling point oils are educted with the aqueous vapour, and collected. This is almost synomous with steam distillation. The second phase of the carbonization follows along the lines employed for hardwood, with the distillate, consisting of acid liquor, heavy oils and tar, being kept separate from that obtained at the earlier stage.

The crude products are charcoal, oils, acid liquor and tar. The liquids are permitted to settle in tanks.

Rectification

The oils and tars are each distilled separately and rectified by fractional distillation. If the original woods were rich in resinous matter, breaks in the rectification of the distillate of the light oils would be made at approximately the following temperatures:—175-300°F (rosin spirit or motor oil according to wood), 300-350°F (turpentine), 350-480°F (pine oil), 480-750°F (rosin oils), and the residuum in the still classed as pitch.

The light oils and turpentine are generally distilled with live steam. The various fractions are frequently further purified by redistillation.

The tar is sometimes sold as such, but where distilled the products are rectified in a manner similar to the oils.

The acid liquor for the recovery of the acetic acid and methyl alcohol undergoes the same treatment as the products of hardwood. The quantity and nature of the prime products vary according to the species of wood and the conditions employed in distillation. The following are the average yields, according to European retort practice, from 4,000 lbs. absolutely dry spruce and fir:

Acetate of lime	132 lbs.
Methyl alcohol	3.5 gals.
Tar and oil	248 lbs.
Charcoal	1360 lbs.

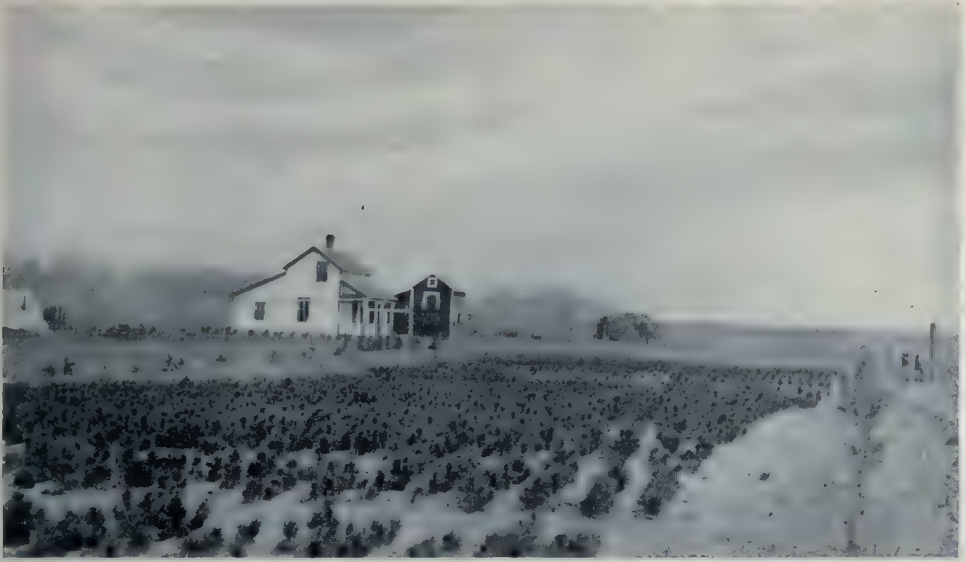
Consideration of Yields.

An examination of the yields of prime products, obtained by the ordinary commercial destructive distillation of hardwood, as shown in the previous communication, compared with that given for experimentally controlled plants, exhibits a very marked difference. But even the yields obtained by controlling the temperature of distillation are disappointing from a theoretical standpoint. The reactions which take place within the retort are the determining factors as to the quantity of prime products which will ultimately be produced from a given amount of wood. It has already been stated that in Canadian factories this part of the operation has not, in the past, been scientifically controlled, but left in the hands of ordinary workmen. That decomposition of valuable products can and does take place within the retort is a well-known fact. The degree of decomposition will depend upon a number of factors, such as—temperature, pressure within the retort, time of contact, velocity of the gases and partial pressures of the compounds concerned. The control of the temperature is one of the most important features of the distillation of wood. It is comparatively easy, with an effective temperature control, to increase, by 25 per cent., the quantities of both acetate and alcohol over ordinary rule of thumb methods, which are in general practice .

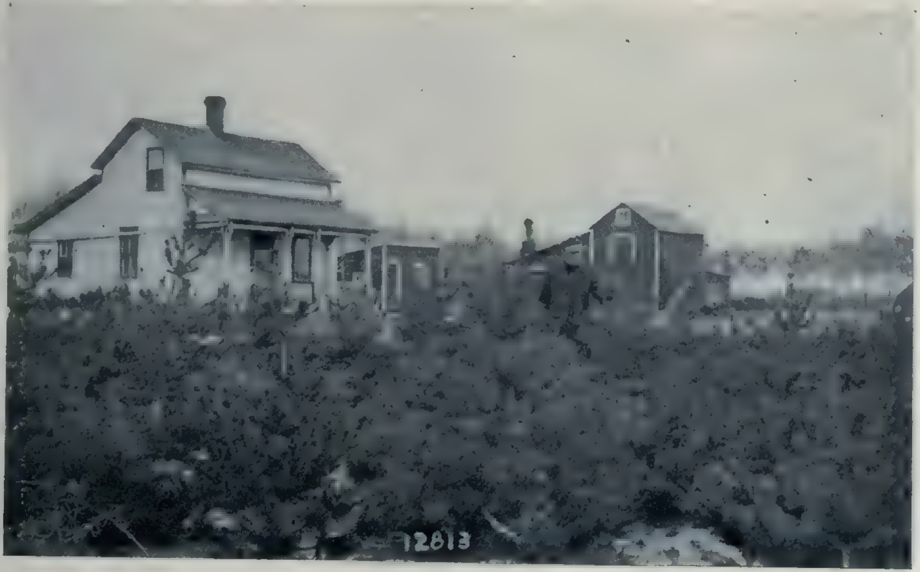
Recording pyrometers should be employed for this purpose, even if they were only installed to register the temperature of the exit gas from the retort. After a number of trials the approximate difference between the temperature of the wood and the gases, before entering the condenser could be determined and allowance made for the difference.

The regulation of the temperature, particularly at the exothermic point, is considered, by some authorities, upon the distillation of wood, as being almost impossible, and by others as overwhelmingly difficult. The writer does not entertain any such opinion, and considers that, were a little thought to be given the subject, cheap and efficient means of control could easily be applied. The quantity of methyl alcohol obtained in practice is, as a rule, less than 33 per cent. of the theoretical amount of the methyl content of the wood. A portion of the alcohol is destroyed in the pyrolytic distillation, while the tar and oils probably contain as much combined methyl residues as that obtained in form of pure methyl alcohol .

When the condensers were considered, in a previous communication, it was pointed out that the condensation of the gases to a liquid was not the only requirement but that the distillate should leave the condenser at a temperature not exceeding 60-65°F. Few factories control the temperature of their cooling water and condensed liquor. If the temperature of the pyroligneous acid, from the retort rises to 80F, which can frequently occur in



The commencement of a jack pine plantation in Saskatchewan.



Same jack pine plantation as above after three years of growth.

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summer when the weather is hot and the river water employed for cooling is warm, the loss of methul alcohol can exceed 20 per cent. The greatest yield of acid, alcohol and gas is at the exothermic point when the maximum efficiency of the condenser is required. Dirty condensors are often a source of loss. The inside surfaces become coated with tar and oil which greatly reduce the conduction of the heat, the distillate therefore is delivered at a high temperature, causing loss of acid and alcohol. Equally important is the condition of the outside surface of the pipes. A scrubbing arrangement should be attached at the end of the condenser system and all the gases from the retort should pass through the scrubbers. The temperature of all the distillates, particularly those containing alcohol, must be subjected to control.

Research Possibilities

The whole process of the conversion of wood into the prime products is a very fruitful field for chemical and engineering research. The reactions by which certain substances are formed and the side reactions within the retort, at various temperatures, have never been studied. That certain substances primarly formed in the retort ,are subjected to decomposition is well known, because the decomposition products not only appear in the proliqueous acid, but with high temperatures, during the exothermic reaction, the percentages of oils and gas are increased, undoubted due to marked decomposition. There is a strong presumption that chemical condensations also occur in the retort, with the formation of aromatic cyclic compounds. An example supporting this contention is based upon the finding of para-xylo-quinone in wood tar. This substance is formed by the condensation of the ½ di-ketone-diacetyl. The so-called oils, or creosote oils, have never been thoroughly investigated, and it is quite probable that these may consist largely of mono-di-tri and olefine-ketones of the acyclic series with some cyclic aromatic compounds. Many ketones are very reactive compounds, with marked characteristic tendencies to condense with the formation of cvclic compounds. It is not known whether these so-called oils are products formed by the pyrogenetic reactions of simpler bodies, or the incomplete degradation of the original constituents of the wood. The former method of formation is more likely. If this should prove to be the case, then it would explain certain of the losses which occur. When the composition of these oils has been established, a commercial use may be found for them. Very little is known regarding the constituents of American wood tar and its formation. Tar does not appear in the pyroligneous acid, from the retort, until a considerable portion of the wood has been converted into charcoal. Why there is not a flow of tar from the moment the first piece of wood is converted into charcoal, is a question which has not been answered. It is possible there may be some relationship between the formation of the oils and tar and the passage of the heated gases over a large surface of hot charcoal. This suggests a series of exceedingly interesting problems which could be made the subject of research. The results would go far towards explaining the reactions and behaviour of the aliphatic compounds within the retort and might lead to improvements in the distillation process.

Hardwood tar forms, quantitatively, the greatest portion of the liquor obtained from the distillation of such wood, the yield being about 250 pounds per cord, so that in factories distilling 10 to 15 cords there is accumulated from 2,500 to 3,750 pounds every twenty-four hours. There is at present known no economic use for this tar excepting its utilization as fuel. Research should bring worth while results. Wood tar is probably composed largely of aromatic compounds containing phenol and methyl groups. If this assumption were found to be correct, then an investigation of the products formed by passing the tar vapours, mixed with hydrogen, through a monel metal or cupronickel tube heated to about 1,375-1,400°F might give interesting results. If proper conditions were established one would expect to obtain benzene and methane.

If successful, the former could be employed as motor fuel and other purposes and the uncondensable gas for developing some of the heat necessary for the reaction. Another possibility, along somewhat different lines, would be the passage of the vapours of the tar over a heated catalyst, with the object in view of obtaining acyclic compounds, having properties resembling the lubricating petroleum products. The proposition of a chemist to utilize the tar as an insulating pitch has suggested another investigation. Could the wood tar not be converted into a resinous substance suitable for varnishes? This might be accomplished by axidizing with air or oxygen, under pressure, in the presence of a catylst, at a temperature of 300-375°F. To the research chemist with a good knowledge of modern organic chemistry, both theoretical and applied, and a rational imagination, the processes involved in distillation of wood and the commercial utilization of its products form a splendid field for investigation.

Economical Problems

In the past many of the wood distillation plants have been paying good dividends, notwithstanding the inefficient and unscientific methods employed. The proprietors have, as a rule, been content to maintain a certain degree of conservatism and only adopt improvements very slowly. Most of the development has been along mechanical lines. On the chemical side the progress during the past thirty or forty years has not been very marked. Those interested in the industry were impatient, expecting that upon scratching the surface of what they thought was the field of research, immediately dollars would be found in abundance, and were doubtless disappointed when this superficial method produced no monetary returns, thus resulting in their adherence to the old system of inefficiency. This is not the true spirit and, in this connection the following quotation from the introduction

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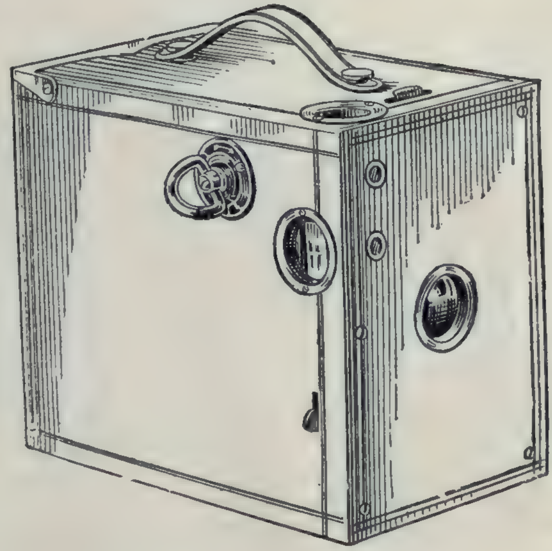

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of the recent report of the British Ministry of Munitions upon the large Gretna factory, which was established during the war, may be interesting: "It sometimes happens that, owing to exceptional circumstances, profits are made alongside of great waste of material. Such a state of affairs is a national misfortune and, apart from the los sof materil, which is likely to cause a nuisance to other people, it is demoralizing and engenders a careless, unscientific spirit in those conducting the operations. Preventable waste of any kind should be considered a sin against mankind." This is scarcely the place to discuss industrial chemical problems, but some of the points mentioned will be found applicable to nearly all industries.

How can the cost of production of the prime products in the distillation of wood be reduced?

1. By increasing the production of cemmercial products from the same amount of raw material.
2. Economy in the fuel requirement.
3. Economy of labour.
4. Improved mechanical equipment and reduction of operations and with this must go, hand in hand, reduced capital expenditure and economy of fuel and labour.
5. Conversion of all byproducts into valuable commercial commodities.

A short discussion of these problems involved in the foregoing may indicate possible lines of improvements in this industry.

1. As already pointed out, there has been practically no scientific control of the retorting operation. The introduction of scientific control. Changes in the arrangements for heating the retort. Changes in the construction of the retort. Both of the latter with a view to reduce the consumption of fuel. With these changes a reduction in decomposition would naturally follow with the resulting increase in yield of valuable products. Where thousands of tons of wood are distilled, the increase in the output by a few pounds and a reduction in this combustion of fuel may make the difference between a dividend and non-dividend paying concern.

2. Within the last thirty years through the quantity of fuel consumed in the wood distillation factories has been reduced from 25-50 per cent., there is still a possibility of further economy. There is the heat lost in the waste products of combustion, there is the latent heat of the vapours from the retorts, of the acetic acid and methyl alcohol vapours from stills, etc., etc. The application and more complete utilization of all these sources of heat in the various distilling, evaporating and drying operations would lead to an economy in fuel and at the same time reduction of apparatus. The complete economic utilization of so-called waste heat is most desirable with present position of the fuel question.

3. By the reduction of the operations and apparatus there should be a corresponding diminution of labour requirements.

4. With the introduction of improved methods, whereby the number of operations would be reduced considerable plant could be

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dispensed with, and a saving of capital accomplished. At the same time the repair, renewal and depreciation charges would be reduced by the installation of improved apparatus in the primary operations.

5. It has already been pointed out that such by-products as the wood tar and oils are substances awaiting conversion into valuable commercial products.

New Position for Mr. Edgecombe.

Mr. G. H. Edgecombe has resigned from the Forestry staff of the Commission of Conservation to take charge of an extensive cruising and mapping project for the Keewatin Lumber Company, on their lands in the Kenora district, Ontario. Since his return from overseas, Mr. Edgecombe has been assistant to Mr. R. D. Craig, who has been in charge of the survey of the forest resources of Ontario for the Commission of Conservation since his return from British Columbia, where he was in charge of the inspection of aeroplane lumber for the Imperial Ministry of Munitions. Mr. Edgecombe's headquarters will be at Keewatin, Ontario.

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How Timber Lightens Our Taxes

Revenues from Crown forests are playing an increasingly important part in the several provinces. In New Brunswick, for the fiscal year ending October 31, 1920, the forest revenues to the provincial treasury aggregated $1,387,005, or more than double those of the previous year. This increase was due partly to an increased cut, partly to increased stumpage dues, and partly to a closer scale.

In Quebec, for year ending June 30, 1920, the forest revenue amounts to $2,604,45.26, or 28.6 per cent. greater than during the previous year. It is estimated that during the current fiscal year the forest revenue to the provincial treasury will aggregate around $3,000,000, which may be increased to $3,500,000 during the fiscal year following.

In Ontario, for fiscal year ending October 31, 1920, the forest revenue was 2,684,843, an increase of nearly 50 per cent. over the previous year.

During the calendar year 1919, the British Columbia Government received in forest revenue a total of $2,755,739.

The importance of perpetuating these revenues, to say nothing of increasing them, is obviously so great that all of the provinces would be amply justified in expending larger sums than at present upon the protection of the forests from fire, insects and disease, upon reforestation, and upon an administration calculated to ensure cut-over areas being left in the best condition to produce continued crops of the more valuable tree species, so far as that may be consistent with the economies of the situation.

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THE ILLUSTRATED CANADIAN FORESTRY MAGAZINE

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Address all communications to Suite 224, Jackson Building, Ottawa.

The Worship of Trees

By Dr. C. D. Howe, Dean, Faculty of Forestry, University of Toronto

Strange Customs, Ancient and Modern of People Who Endow Trees With Human Susceptibilities

In explanation of writing on the above subject, I would like to say that the more I study trees in their various aspects, the work they accomplish in rearing themselves into the air, their delicate adjustments in the struggle for existence, their beauty of form in season and out of season, not only the greater is my appreciation of their value in the economy of Nature, but also the greater is my reverence for them. Since I have come to a sympathetic appreciation of the spirit of those who hold trees in greatest veneration, even worshipped them, it is only natural that I should desire to know something of the role trees have played in legend, folklore and mythology. So I propose to give the readers of the Canadian Forestry Magazine some of the results of my reading along these lines.

In my native village, I have a friend who is a wood-chopper. Nearly all his mature years having been employed in this profession, and being an observing man, a rare character in a way, he is very sensitive to the impressions of the forest in which he works and very sympathetic in his attitude toward all forest life. He believes that it hurts a tree to cut it down. The peculiar sound sometimes heard upon the withdrawal of the axe blade after a well-driven blow, the sounds of creaking and wrenching of the wood when the tree falls, he believes are the protests of the tree's spirit on being so roughly handled. I don't know that he does it, but he says that he feels like apologizing to a tree every time he cuts one down.

Believers in Tree Spirits

It would interest my friend to know that certain Filipinos will not cut a tree until they have begged its pardon and recited some verses, which mean: "Be not uneasy, my friend, though we fell what we have been ordered to fell." Ancient East-Indian books prescribe that in preparing to fell a tree, a woodsman should lay a stalk of grass on the spot where the blow is to fall, with the words: "O, grass, protect him," and that he should say to the axe, "Axe, harm him not." When the tree had fallen, he poured butter on the stump, saying: "Lord of the Forest, grow with a hundred branches, and may we grow with a thousand branches." Certain natives of Sumatra dislike to disturb the spirit of trees and when compelled to, they blame it upon the Dutch authorities. Such a native will not ply the axe to a large tree until he has said: "Spirit who lodgest in this tree, take it not ill that I cut down thy dwelling, for it is done at no wish of mine, but by the order of the overseer." When he wishes to clear a plot of land for cultivation, he picks up a bit of paper which he pretends is a letter and reads aloud an order from the Dutch Government, commanding him to clear the land without delay. Having done so, he says: "You hear that, spirits, I must begin clearing at once or I shall be hanged." Thus he absolves himself from blame and frees himself from any revenge on the part of the spirits. It is a common practice in various parts of the East Indies for the natives when they clear the jungle to leave standing trees to which the spirits they have dispossessed may go. Perhaps the origin of our "seed tree method" in silviculture could be traced back to some such practice as this. Certain tribes of the American Indians believed that the spirit of the cottonwood possessed an intelligence which, if properly approached, would help them in their undertakings. In fact, they ascribed their misfortunes in later years to disregard of the rights of cottonwood trees. Many Negro tribes in Africa believe either that all trees or certain trees are in reality spirits. Siamese monks will not break a branch of a tree, for thus they would forcibly dispossess its soul.

Prayerful Axe Handlers

My friend the wood-chopper does not share his belief alone with uncivilized or primitive people, for we find a writer of popular science, around 1670, saying: "When an oake is falling, before it falles it gives a kind of shriekes or groanes that may be hearde a mile off, as if it were the genius of the oake lamenting." Old peasants in some parts of Austria still believe that trees have spirits and will not let anyone injure them without special cause, for they believe that the tree feels the cut not less than a wounded man his hurt. In felling a tree they beg its pardon. On certain Greek islands, when the woodman fells a tree which he believes to possess a spirit, he is most careful when it falls to prostrate himself humbly lest the spirit should chastise him when it escapes.

It seems that the most primitive people believe the tree itself is the spirit or at least when the tree is killed its spirit is killed. Later the tree simply becomes the abode of the spirit which can leave its habitation at will. This conception leads to offerings and ceremonies of various kinds as a propitiation of the spirit when the tree is felled. Thus, the Negro, on the Slave Coast, who wishes to fell a certain tree sprinkles palm oil on the ground near it. The spirit comes out to get this delicacy, and as soon as it leaves its abode, the wily negro cuts the tree. The natives of Central Celibes offer the tree spirit food when inviting it to leave before cutting a tree. The spirits inhabiting trees may be good spirits or bad spirits, or they may be the spirits of ancestors, departed friends or relatives. The latter conception led to the veneration and finally to the worship of trees.

Druid Oak Worshippers

From whatever race we may have come, our remote ancestors at some time worshipped trees. Among the Celtic peoples was the well known oak-worship of the Druids. This, doubtless, first began as ancestor worship, and gradually developed into the formation of a priestly class who were the educated class and the real rulers, and gradually declined into magic and sorcery and finally disappeared, before the spread of Christianity. Sacred groves were common among the ancient Germans and among the ancient Prussians who came from Lithuanian stock. The sacred oak groves of the latter were tended by priests who kept up a perpetual fire of oak wood in the holy groves. Traces of this worship extended down to the middle of the nineteenth century, when it is said that offerings of food were still made to the spirits of the oak. At Upsala, the old religious capital of Sweden, there was a sacred oak grove in which every tree was regarded as divine. The oak tree was sacred to one of the gods of the ancient Slavs. The sacred fig tree of Romulus in Rome was worshipped down to the days of the Empire and on the slope of the Palatine Hill grew a dogwood tree which was considered one of the most sacred objects in the city. Plutarch tells us that whenever a passer-by noticed the tree was dropping, he spread the alarm and people rushed from all sides with buckets of water to spread over its roots.

It is only natural that the primitive people of northern and central Europe should have worshipped trees, for at the dawn of history Europe was covered with immense primeval forests in which the scattered human habitations must have appeared like islets in an ocean of green. Their vastness, their solitude, and their mystery made a profound impression upon the imagination of a simpleminded people. It is only natural that they placed their gods in the forest on the same principle that other people living in a semi-arid, non-forested region of brilliant skies placed their gods in the heavens.

Thus the friend in my native village has a long train of companions in his belief that trees are the abodes of spirits. The idea may have come to him as a vestigial characteristic from a faraway ancestor, or more likely it came to him because of his long and sympathetic association with the forest.

Tree Divinities for Human Control__

The tree spirits were at first doubtless appealed to only in personal or family affairs, but as they came to be worshipped as gods they were given a more or less human form, and they gradually assumed greater or less control over the sequences of nature and the affairs of men. For example, trees or tree spirits were believed to give rain and sunshine. The spirits were appealed to on the principle of imitative magic. Thus in a village in Russia, when rain was much wanted, three men climbed the fir trees of an old sacred grove. One of them drummed with a hammer on a kettle to imitate thunder; the second knocked two fire-brands together and made the sparks fly to imitate lightning, and the third had a bunch of twigs with which he sprinkled water on all sides from a vessel.

Tree spirits were believed to make crops grow. Among the Aryan tribes of the Gilgit on the northwestern frontier of India, the sacred tree is a species of juniper. At sowing time, the wheat is placed in a bag mixed with sprigs of the sacred cedar. A large bonfire of cedar wood is made and the wheat to be sown is held over the smoke. Other wheat is made into bread baked on the same fire and given to the ploughman. Unless the wheat is thus mixed with the odor and essence of the sacred tree, it will not be fruitful. Many tribes in southeastern Africa will not cut down timber while the corn is green, fearing if they did so, the crops would be destroyed by blight, hail or frost. Other African tribes sacrifice goats or other animals to certain trees before they will begin their harvest. Swedish peasants to this day stick a leafy branch in each furrow of the corn field, believing that this will insure an abundant crop.

In almost every country in Europe the peasants of certain localities hold harvest festivals in which trees or parts of trees play a prominent part. Usually the tree or a large branch is decorated with the last portion of the crop to be harvested and is brought home on the last wagon from the field. After a ceremony of some kind the decorated tree is hung on the roof of the farmhouse or of the barn, in the belief that its presence has a vivifying or fructifying influence on the seed to be planted the following season.

These harvest festivals were held either on the 20th of September, the close of summer, or on the 21st of December, the beginning of winter, in ancient times, and are still held on the former date among the peasantry of Europe. As we have seen, trees or parts of trees are central figures in them. We have in America the lineal descendants of the September ceremonies, with the trees left out and their significance forgotten, and, of course, with the spirit adapted and modified, in our country fair, harvest home and Thanksgiving, while in the December ceremony the tree still plays the leading role in our Christmas.

Talking Trees !

Barren fruit trees are sometimes considered to be the abode of evil spirits, and they must be driven out in order to make the tree productive. Thus among certain Malay tribes a man strikes a barren durian tree, which normally bears a delicious fruit, three times with an axe, saying, "Will you now bear fruit; if not, I will fell you." A man in an adjacent tree, personifying the tree spirit, replies, "Yes, I will bear fruit. I beg of you not to fell me." Odd as this mode of horticulture may seem, it has an exact parallel in Europe. On Christmas Eve many a Slavonian and Bulgarian peasant swings an axe threateningly three times against a barren fruit tree, while another man, standing by, intercedes in behalf of the tree, saying, "Do not cut it down. It will soon bear fruit." The peasants of Armenia and Greece treat barren fruit trees in a similar manner. The driving of nails or the inserting of various foreign substances beneath the bark, as is sometimes still done in the case of barren fruit trees, doubtless also had its origin in the belief of thus dispossessing evil spirits. In some localities in England it is believed that whipping a walnut tree not only increases its production, but improves the flavor of the fruit. I trust the reader will not misconstrue the sentiment, if I quote in this connection a popular rhyme:

"A woman, a spaniel and a walnut tree,
The more you whip them, the better they be"

(To be continued)

Photos copyrighted by U. S. Rubber Co.

The man in the foreground is inspecting the tree. It is his duty to see that the tappers do not wound the wood of the tree and that the proper "angle of cut" is maintained. If the cut is too near the horizontal, the latex spills over the bark instead of draining into the spout and then to the cup.

The Story of the "Rubber Tire Tree"

What the automobile would be without rubber tires would be hard to imagine. Without rubber, some automobiles would undoubtedly be manufactured, but they would certainly be rattlebang affairs of slow speed and much vibration. It is quite true that following the invention of a successful engine, automobile development has been conditioned very largely upon the development of tires. This fact is amply demonstrated today, through the revolutionary changes taking place in motor truck construction due to the adaptation of the pneumatic tire to use on motor trucks, Germany had a chance to find out what automobile operation without rubber tires was like during the war, and she did not relish the experience.

It is the purpose of this article to show how it happened that when the automobile industry burst upon the world, with a need for rubber which the recognized sources of supply could not have begun to meet, there was found ready in a new quarter, a supply so adequate that the progress of the industry has not been halted for a second by any shortage of rubber. In other words, this is the story of the rubber plantations in the Far East.

Until ten years ago, rubber meant rubber from Brazil. There were some other sources of supply of inferior grades, but practically all the prime rubber came from Brazil. Today Brazil's supremacy is gone. In less than a decade, the Far East has jumped to the front, and is now producing nine-tenths of the rubber of the world.

The history of the passing of the glory of Brazil in this particular, has a touch of romance in it. In the sixties an Englishman named H. A. Wickham spent much time in Brazil in the rubber field. He conceived the idea that the rubber trees which grow wild in Brazil could be cultivated and grown on plantations. But he was ahead of his time, and found little encouragement.

This is a typical Jungle scene in Sumatra. Before a Rubber Plantation can be laid out the Jungle must be cleared. The trees are cut down and burnt off, the stumps pulled out, the ground plowed and cleared of weeds and roots usually by hand:

Wickham finally enlisted the interest of Sir Joseph Hooker of Kew Gardens, London, who had been considering the possibility of introducing the trees to India. Hooker in turn interested the government of India in the project, with the result that Wickham was given a commission by the Indian Government for the introduction of the Brazilian tree into India.

The seedlings were sent to Ceylon because it was decided that the climate of the Island was better suited than that of India for the rearing of the precious trees. The gardens at Heneratgoda, sixteen miles from Colombo, were opened as their permanent resting place.

The planters in Ceylon did not take hold of rubber planting with the same eagerness as did the planters of Malaya. In Ceylon they were making good profits in tea growing, and had no need to make a change. But in Malaya the planters, and the financial interests in Europe who had sent them out, were sick to death of the struggle to make a living out of coffee and, though in fear and trembling, began to plant this new thing, rubber, hoping if possible to save their estates from abandonment.

Lucky was it for Malaya that she fostered this new enterprise, for now within her territory lie the greater part of the rubber plantations of the world.

Fabulous Profits

The romance of plantation rubber, is the old, old story, a few resolute men working in eastern jungles, having faith in the ultimate success of the work they had undertaken, and that of those daring to put their capital into faraway lands. It was but a few years ago that practically all the planters were feeling acutely the pinch for funds to tide them over the early stages of the enterprise. Many cases could be cited where fifteen years ago $25,000 to $50,000 could not be found to carry on estates being planted in rubber, which are valued today at four to five millions.

When a market for plantation rubber began to develop, the needy planters were astounded at the fabulous estimates of profits which they figured out of their estates, and dared not present them to financiers until they had divided the probable profits by four. Even then, these estimates appeared in the light of a fairy tale, and Lor financial men shrugged their shoulders, buttoned up their pockets, and thought they had gone a good day's work when they had got rid of the importunate planter and his castles in the air.

The excitement culminated in the historical and regrettable "boom" of 1910. By good fortune, the bubble was deflated without bursting, and now the financial affairs of the plantations are on a very substantial basis.

Nine Millions Cars

American interest was attracted to the plantation industry in 1910, when the British and other Europeans had invested between three and four hundred million dollars in estates. The United States Rubber Company, the largest consumer of crude rubber in the world, was one of the first of the American concerns to investigate the possibilities and enter the field. The Dutch island of Sumatra was chosen for the company's activities. This American corporation has established there the largest single rubber plantation in existence. The tract contains more than 70 square miles of trees in a high state of cultivation and close to twenty thousand employees are at work in the great orchard. The high standards of administration and scientific culture which have marked this project have implanted in the minds of the dwellers in that fair eastern clime a thoroughgoing respect for American efficiency.

While the nine million cars of this continent skim along on their tires made of plantation rubber, one cannot but pause to wonder again at the curious coincidence that has made it possible to furnish in abundance the necessary rubber.

Few of the planters who embarked in the early days on the plantations venture had even heard of the automobile, when they set out their trees. Those who had kept in touch with affairs in England might have heard of the horseless carriage preceded by a man on foot carrying a red flag as a danger signal, but none of them realized that this object of England's merriment was the forerunner of the great automobile industry of today.

How Plantations have grown

By the end of 1907 only about 1½ per cent of the world's rubber had been produced from plantation rubber. At that time, about $1.00 per pound was secured for this rubber at the plantations, which was considered a satisfactory price. By 1910 the price had risen to $2.50 per pound and a great boom was created in plantations. The present area of rubber plantations of all kinds is estimated at nearly 2,000,000 acres and new areas are being constantly planted. The soil and climate of the Far East seem to be peculiarly suited to the successful growing of the Para rubber in plantations.

There are said to be over $400,000,000 invested in rubber plantations and they supplied in 1919 about 83 per cent of the total world's requirements.

How rubber is tapped

The methods of tapping and reducing the latex have been greatly improved over the systems in vogue with wild rubber, although it cannot be said that they have reached a finalty of development. A common method is to make a series of V-shaped incisions on four sides of the tree up to a height of 5 to 7 ft. from the ground. The latex is collected in a cup hung at the apex of each V. The "herring bone" plan with a vertical incision and lateral channels on either side is used as well as the spiral system. Daily incisions are made at 45° until the trunk is nearly covered with scars. When the bark of the trunk is almost completely covered with cuts to induce the flow of latex, a period of years is generally allowed to elapse before beginning to retap the tree. Small sharp knives are employed in making the incisions instead of the axes or large cutters used in Brazil.

Instead of the primitive and wasteful method of reducing the latex of crude rubber, as followed in the forests of Brazil, the fluid is collected in large tanks or casks. It is coagulated by the admixture of an acid, usually acetic acid or lime juice. The coagulation gradually separates as a soft, white, or yellowish mass. This is washed by first passing through washing machines, and then through other machines, which compress it in thin sheets or long ribbons called crepe. These are hung up and dried. Plantation rubber enters the market either in the form of crepe in sheets or biscuits or in the form of large blocks made by compressing the sheets of crepe together.

A weeding gang drawn up to undergo the annual experience of having their photographs taken, before they start out to clear the weeds betwen the trees. Owing to the quick growth of vegetation in the tropics it is necessary to weed continually.

Two-year old rubber trees. The ground must be kept clear of all weeds and undergrowth because of the danger of fire and disease caused by decaying vegetable matter.

The forest ranger's post box at the end of his lonely patrol along the Nelson River.

A forest survey party on the Nelson River.

The Forest Ranger as a Specialist

By W. N. Millar, Toronto

What a Ranger Should Know, and How He Should Be Trained

It is almost platitudinous to say that the success of any administrative organization depends primarily on the character of its personnel. The great fundamental problem in all organizations having a number of employees is the improvement of the standard of these employees. One need only recall the revolution which the efficiency expert has produced in modern industrial plants, the training school for employees maintained by so many of the more complex manufacturing and distributing industries, such as department stores or electrical supply factories, or the naval and military service schools which train the men to greater efficiency in their duties, to realize that everywhere, in all branches of industry, the need of special training is realized and active steps are being taken to provide it. In the work of forest protection and administration this need is in no degree less urgent. In European countries such as Germany, France and Switzerland, employees in the governmental forest services are required to undergo a long and painstaking course of training and to serve an apprenticeship extending over years. In the British India forest service men are trained for rangers and higher positions at the forest academy established and maintained since 1878 by the Imperial Government at Dehra Dun, where instruction is given both in English and in the vernacular. In the United States all employees of the service below the grade of Associate United States Forester are required to pass a rigid practical examination to qualify for employment and are then employed only in subordinate positions on probation and are required to demonstrate their fitness for permanent employment before being accepted by the service. Higher positions are filled only by promotion from lower grades, and promotion and increase in salary are given for merit alone.

The Canadian Custom

In Canada the fact that forest employees require any special qualifications of training has scarcely yet been realized. It might be well to call attention to the variety of employees in the Dominion service in one district alone. These include twelve distinct classes, as follows: — Forest Supervisors, Forest Assistants, Forest Rangers, Fire Guardians, Surveyors, Book-keepers, Stenographers, Carpenters, Cooks, Packers, Teamsters and Labourers. The qualifications for a cook, a surveyor, a stenographer or a carpenter are fairly well defined and can be readily appreciated by anyone.

So also the forest assistant must have a technical training in forestry which involves a college course in the science as a general rule. But when we come to the forest ranger no such special requirements are realized. There is an almost total failure to appreciate that the work of a forest ranger is a highly specialized employment calling for a physical and mental equipment and training no less susceptible of exact definition than is the profession of the surveyor, the cook or the book-keeper. Present-day methods of fire protection for standing timber are as much advanced over the methods of twenty years back as is the modern motor fire-truck an improvement over a bucket brigade. In similar measure have the requirements for the position of forest ranger advanced, although this has not been generally realized. No longer in those countries where forest fire protection has been developed along modern scientific and practical lines, is the forest ranger handed an axe and a badge and told to go out into the woods and prevent fires, any more than is the modern soldier given a war-club and told to go out and fight the enemy. The present-day ranger is a unit in a highly perfected organization. Fires are located for him by lookouts stationed on peaks selected with all the care of a topographer choosing triangulation stations, and equipped with rangefinder, telescope, compass, maps and telephone. He receives his call to action by telephone, telegraph, wireless or heliograph. Instead of rushing out coatless and hatless to wage a single-handed fight with whatever tool is handiest, he considers his carefully drawn fireplan, notes on his topographic map the lie of the land at the fire; decides upon the forces necessary for its control and the quickest way to get them on the ground, and then by means of his telephone he sends to that fire enough men and horses fully equipped with tools and provisions to smother it in its very incipiency in less time than the old-style ranger would have taken to gather together his grub-pile and saddle his horse. This is no idealistic picture, but an actual accomplishment fully developed and regularly employed by government and private owners of timberlands who control more timber several times over in the United States alone than stands in all Canada.

Moreover, fire protection does not by any means exhaust the duties of a ranger on the reserves. It is now generally realized that forest reserves are not created to take out of use but to put it to use under methods of scientific forest management that will insure its continuation as a permanent crop instead of permitting it to be exhausted at one cutting. If it is realized that it takes from four to six years of collegiate training to give men the fundamentals of this art of forestry it will be conceded that the forest ranger, upon whom falls the duty of carrying out the plans for scientific forest management, cannot be fitted for these duties unless he has been specially trained for them. It might well be asked, if a forest ranger is not simply a man who can ride a horse and swing an axe, what his qualifications are.

What should a Ranger know ?

Putting aside the fact that rangers in the Canadian service are not infrequently unable to produce even these rudimentary qualifications, it might be answered that a forest ranger should be a man in perfectly sound physical condition, not too old to endure the hardships of wilderness travel — say, between 20 and 45 — a first-class experienced woodsman, able to pack, cook, establish camps in a sanitary manner, and handle horses and boats. He should be either a practical lumberman acquainted with both the woods and the milling end of the business or a practical stockman, or both. He should have at least a common-school education. He should be able to make all kinds of compass, surveys and prepare simple maps, to cruise timber, to lay out, estimate and construct trails, to erect forest telephone lines, install instruments and maintain them in working order, to plan, estimate and construct ordinary log and frame buildings, to handle crews of men, to deal tactfully with forest reserve users and mountain travellers and sportsmen. He should have some knowledge of elementary silviculture, know the common trees and forage plants of the region, know something of the habits of the fish and game animals and enough of forest insect and fungous diseases to recognize an infestation on sight. Needless to say, he should have had previous practical experience in fire-fighting before being placed in a responsible position involving the direction of such work. A ranger must also be able to write concise, intelligent reports on all lines of his work, to maintain the necessary office files and records and must be thoroughly conversant with all the various laws and regulations which he is called upon to enforce and administer; being empowered to arrest without warrant, he must be familiar with the legal machinery of his province and know how to present and handle his case in court, to collect evidence, and establish his charge with competent testimony.

It may well be asked where men with such varied qualifications are to be obtained, and it must be admitted that they cannot be found in Canada to-day. Yet forestry as it is understood and practised by almost every civilized and progressive nation in the world, demands that men with these qualifications be secured to form the very foundation of a forest organization. The experience of foreign countries is enlightening. In Germany, and other European states where forestry has been practised for generations, forest academies conducted to a large extent under government auspices prepare men for the grades that correspond to the forest ranger, and subsequent training at their own expense in government employment completes their preparation. In India, the Philippines and Japan, government training

A fire patrol boat at Athabaska Landing.

A sturdily built forest ranger's cabin on one of the Alberta forest reserves.

Amphitheatre ranger station, British Columbia.

schools have been established. In the United States, training has been supplied to some extent by special ranger schools, of which quite a number exist in connection with state and other universities, and also by the government itself through its ability to select only suitable candidates, as determined by a qualifying civil service examination, and then train these men in its organization, under civil service rules that require a man to show satisfactory results or suffer dismissal.

A party of forest rangers, Northern Alberta.

Forest Rangers packing on the trail, Coast District of British Columbia

The Careless Smoker

Apologies to Kipling

A fool there was and his pipe he lit
(Even as you and I)
On a forest trail where the leaves were fit
To become ablaze from the smallest bit
Of spark — and the fool he furnished it
(Even as you and I)

The forest was burned to its very roots,
Even beneath the ground,
With the flowers, the birds and the poor dumb brutes,
Old hoary oaks, and the tender shoots
Which might have made logs but for such galoots,
Allowed to wander around.

The lumberjack has now passed on,
His pay-day comes no more,
And the screech-owls haunt the camp at dawn
Where the cook's tin pan woke the men of brawn:
But the mill is silent, the trees are gone,
The soil and forest floor.

A deadly sight are those hills of rocks
Which once were beds of green:
No hope for the human, no food for the flocks:
The floods must be held by expensive locks,
While the harbor is silted to the docks—
The ships no more are seen.

But the fool smokes on in the forest still,
Leaves campfires burning too,
While the patient public pays the bill
And the nation's wealth is destroyed for nil.
If the law doesn't get him, the Devil will—
Smoker, it's up to you

(Written by the District Forester
at Ogden, Utah)

Grouping of B. C. Forest Trees

In a lecture before the Cowichan Field Naturalists' Club, at Duncans, Mr. C. S. Cowan, assistant chief forester for B. C., described in most interesting manner the forest growth of the Vancouver forestry division, which includes Vancouver Island and the lower mainland. There were, the lecturer said, five distinct groupings as the trees occurred in the natural forest. He classified these as follows:

1. Douglas fir — Red cedar group, with 50 per cent fir, 25 per cent cedar, the remainder mixed.

2. Red Cedar — Western hemlock group, with 50 per cent cedar, 25 per cent hemlock, balance mixed.

3. Western Hemlock — Sitka spruce group, with 50 per cent hemlock, 25 per cent spruce, balance mixed.

4. Western Hemlock — Balsam group, 50 per cent hemlock, 25 per cent balsam.

5. Subalpine and muskeg group — not of much economic importance.

Types of each tree were described, their individual characteristics pointed out, the range of altitude and latitude of each, and average age and height of each given. Diverging to the subject of forest control on water run-off, Mr. Cowan ascribed the serious floods in the lower Fraser valley to the burning of the forests along the slopes of the watershed from various causes. Eighty per cent of the melting snows run off quickly instead of being held back by the forests and allowed to run off slowly.

Wooden Ships a Hundred Years Old

"Wooden ships do occasionally last a hundred years", says a sea captain of Pensacola, Fla., in a recent letter to the Literary Digest. One of them, a schooner, he saw two years ago at a Danish port. It was owned by a former mate who said that he was doing well with his more than one-hundred-year-old ship. The captain vouches also for another ship which sailed between Denmark and Greenland from 1801 to 1900. After its sailing days were over, it was used as a restaurant ship and later as a stationary training ship. The letter was written to uphold the claim that there are some centenary ships.

Canada's real timber problem is not to use less timber but to grow more. Millions of acres of timber lands, such as shown in the picture, are not reproducing more than a fraction of their original values.

To Make Our Forests Self-Sustaining—Which Method?

By Frank I. Ritchie

Manager, Wayagamack Pulp and Paper Co., Three Rivers, Quebec.

A Comparison of Artificial Tree Planting and Natural Reforestation.

THIS subject is one that has been seriously considered for a number of years by the Directors of the Wayagamack Pulp & Paper Co., Ltd., of Three Rivers, Que., who, having gone into the matter very exhaustively, now submit the views of their Forester, Mr. Henri Wickenden, and ask other Companies similarly interested to take up the question and criticize, and at the time put forth their own ideas on the subject.

After carefully watching the operations and methods of older companies, it was felt that for proper conduct of this part of a pulp and paper company's business it was essential that there should be two departments in the woods, working in very close harmony one with the other. These were, Firstly: the Operating Department, whose duty it would be to cut the timber and bring it to the mills at the least possible cost to the Company, and secondly: the Forestry Department, whose duty it would be to see that the Woods Operating Department carried out their part of the work in the most scientific and approved manner, so as to insure as far as possible wood economy and a good regrowth in the cut-over areas, and in addition to this to take up the question of replanting where deemed necessary or advisable, and at the same time to study and watch everything that affected the growth of the forest, such as insect-pests, tree diseases, soil conditions, drainage and climatic conditions, etc.

After making very careful enquiries it was decided that of all the various European countries that had developed and made a study of forestry, Scandinavia offered the best school, as the forest conditions and climate of these countries most nearly approximated our own, accordingly Scandinavia was chosen as the place in which to carry on our studies.

The next point was to obtain a Forester, and here the question arose as to whether it was more advisable to send a man from this side to learn Scandinavian methods, or to bring a forester from Scandinavia who would have to make a study of Canadian conditions before he would be in a position to give the full benefit of his knowledge. In either case it meant a delay of several years before a man could be properly equipped to carry out this work.

The Company finally engaged Mr. H. R. Wickenden, who had just completed his Civil Engineering Course at McGill, who was fluent in both French and English, and who had in addition spent five seasons with the St. Maurice Forest Protective Association.

Mr. Wickenden was sent to Norway and Sweden, where he remained for several years attached to the Chief Foresters of such companies as the Kramfors Company, owning nearly two thousand miles, of which Baron Mannerheim, who visited Canada last year in connection with the pulp and paper industry, is Managing Director ; the Uddeholm Company, one of the most important companies located in the centre of Sweden, operating over one thousand miles of territory where conditions are very similar to the St. Maurice, the Finspong Company, operating on some of the largest and oldest plantations in Sweden, also various other Government and private forests located in middle and southern Sweden and Norway, such as Baron Adelsward in Atvidaberg, Storra in Kopparbergs, Bergslag in Dalarne, completing his study with a course in the Royal Institute of Forestry, Stockholm.

Since returning to Canada, Mr. Wickenden has spent two years in the Company's forests, carefully comparing them with Scandinavia.

Appended to this article are some of the conclusions at which he has arrived as being most adaptable to the various kinds of forests which he has touched upon, and which conclusions have had the hearty co-operation of the Chief Forester of the Province, Mr. G. C. Piche, who is on the eve of departing for Sweden, where he intends to look over the work which is being done by some of his assistant foresters whom he has sent over to study Scandinavian methods.

There are two methods of reforestation: Artificial Reforestation and Natural Reforestation.

Artificial Reforestation

This has been experimented with by several of our leading paper companies in the Province of Quebec and the result of these experiments can be seen by anybody who wishes to visit the various plantations.

Mr. Wickenden is of the opinion that artificial reforestation can be carried out on a commercial basis only where land can be had cheap, of suitable soil and in close proximity to an abundant labour market.

The Companies who have experimented along the lines of artificial reforestation, today practically admit that it is not commercially successful. Were this method feasible from a cost point of view, it would be impossible to find sufficient waste or suitable land on which to plant trees to take care of the enormous annual cut of the various Companies operating in the Province, without practically turning a very large part of the farming land back into forest.

While this method may be and is practicable in some places, he is of the opinion that it cannot be carried out along the Northern St. Lawrence, and therefore, there is no object in giving very serious consideration to this first method.

Natural Reforestation

After two years of careful and thorough forest research and surveys, carried on in the St. Maurice district to determine the exact conditions of the forests and what has been the effect of the previous handling, this study shows that nature here does much the same as in Scandinavia. Basing his decisions on the findings of his research, it will be possible to formulate a plan of operation by which natural reforestation and perpetuity will be practically assured, since nature when not hindered, but aided by the work of man, will effect its own regrowth.

Frank J. RITCHIE, Manager.

Mr. Wickenden's views are hereto appended.

Make Nature Our Tree Planter

By Henri Wickenden, Forester of Wayagamack Pulp and Paper Co.

FROM my observations in the Forests of the St. Maurice District, I found in the old cuttings, made in accordance with the Government regulations, conditions existing as follows:—

The trees left standing after cutting operations were largely old mature trees, which had been hindered in their growth, and were left because of their not having reached the minimum diameter allowed to be cut, and in fact they never would. These trees were also unfit to supply healthy seed in sufficient quantities for the regeneration of the forest. About sixty per cent of the trees left standing had been blown during the first ten years or so, this along with the debris formed a dense abatti, which in many cases hindered the growth of the young trees and was a nest for insect pests and tree disease. In many cases the old cuttings had been burnt over.

Generally speaking, if all the merchantable timber had been cut, it would have reduced the wind-falls, and hence the fire risk, and the quantity of timber obtained per acre would have been much greater.

My studies of the virgin forests show, that, if the methods of operation which I herewith outline are carried out, the above conditions would be largely cured.

The Saint Maurice District

Proposed Method of Operating and Regenerating Mixed Type of Forest.

Spruce, Balsam, Pine, Birch, Poplar, etc.

Mixed wood, as per above heading, is the most predominant in this region, occurring in sites where leaf species and conifers grow equally well. Almost all of these woods are over mature, that is to say, the trees are mostly beyond the active growing stage, and in fact have reached the point where the loss by rot, insect, and wind damage, exceeds the wood growth laid on the sound timber. We find that practically all the present forest areas have been burnt over at one time or another, and that stands take about one hundred years, more or less, to mature, and if cut before or at maturity, the quantity of sound timber obtained per acre would be much greater than at present. It is characteristic of old age to be susceptible to attack by disease and to physical strain: likewise old trees being low in vitality fall an easy prey to insects and fungi or being partly rotten are readily broken down by wind storms or by winter snows and sleet.

The depletion which is now going on is being slowly replaced by seedlings which come up in large numbers in the openings left by fallen groups of trees, in fact, in any place where light and heat are sufficient to cause the bacterial action or soil decay necessary to the development of seedlings. Natural reforestation can be greatly aided by handling the mixed wood type of forest in such a way as to prevent wood waste through disease and insect ravage and by aiding nature in bringing about a strong increased growth.

The mixed woods in the region occur under varying conditions:

(1) We have mixed wood growing on fertile ground showing a great wood producing capacity.

(2) On soil where the humidity varies from moist to fairly dry, the wood production is fair and the method of cutting outlined lated on is especially suited to this type and can with few excepitons be carried out over large and continuous areas.

(3) We also have the exposed areas where discretion will be exercised in cutting to prevent ravage due to wind storms. This applies to mountain tops, light shallow soil and generally exposed positions.

How Nature Operates

On investigating the natural process by which the forests are perpetuated one finds several positive features for regenerating the forests.

Wherever well drained but not dry conditions exist, one finds masses of balsam and spruce seedlings coming up in openings sufficiently large to admit plenty of sunlight and heat. The soil seems to be altered under these conditions; moss disappears and the debris decays rapidly making an ideal seed bed. In the present mixed wood such openings exist where wind storms have blown down all the trees, where a clearing has been made by man, or where a forest fire has killed the trees (without destroying the

A particularly bad piece of windfall whereby as much timber was wasted as was taken off.

soil). Fifteen years or so after such clearings have been made, the balsam is generally so dense that it is impossible to walk through it. In case of forest fire, where it has only skimmed the surface, one finds very similar conditions to these, namely, that the seed remaining uninjured by the fire soon causes a dense young growth to spring up. Birch and poplar generally thrive best of all and come up first in large numbers due to the enormous masses of seed blown in from outside and the large amount of direct sunlight which they receive on an old burn. The birch and poplar evidently act as a protection and are part of the natural process of regeneration.

From the above it is evident that the natural regeneration of the coniferous trees requires certain fixed conditions, First, the direct action of light and heat on the ground, Secondly, a certain amount of protection (in this case given by birch and poplar). Thirdly, plenty of tree seed.

Guiding my judgment on extensive local research which has brought to light the above facts, and finding support for my deductions in good Scandinavian practice, under exactly similar conditions, I would propose the following method for handling the mixed wood stands.

Instead of as heretofore, leaving only undersized trees, the runts of the forest, to wither and struggle in the stand, either shading the ground too much or falling down and hindering most of the mature seedlings, we would clean up the ground as far as possible during logging, by removing all damaged trees over certain areas, and leaving a number of young, or at any rate, most vigorous and well shaped trees to cast seed over the ground. The old top storey of birch would act similarly to the birch in the burn, and remain until the time came when balsam and spruce grew over it and stifled it. The seed trees remaining being healthy and vigorous trees as far as such can be found, would lay on a certain amount of growth. This is contrary to the present system by which eventual growth after cutting is laid only on the smaller and damaged trees.

Where seed can come from

Since two of the conditions can be obtained by cutting properly, the one vital question remaining is the production of seed. A few vigorous trees can cast hundreds of thousands of seeds over the small area surrounding them. The seed being winged, one finds them on the March snow carried by the wind one hundred feet and more from the mother tree. One single tree can obviously produce many times as much seed as one could ever hope to sow broadcast should one attempt this method of regeneration.

According to extensive research in several countries the fact is well established that young and vigorous growing trees produce the best fertile seed and the most seed. Spruce trees reach the above stage at about fifty years and more of active growth. A healthy tree should reach 7" or more diameter breast high at that age, and a height of forty-five feet and over. A seed tree should be sound and have a very full crown; incidentally this type of tree is one of the least susceptible to being blown down by storm.

Considering that trees can cast such great distances, the leaving of seed trees a fair distance apart would ensure a plentiful supply of seed.

Cut the Balsam Clean

I propose that considering the tendency of the balsam to crowd out the spruce also its great facility in reproducing itself, and its susceptibility to rot and insect pest, it should be cut clean in this region. Even then the amount of seed in the ground and the number of seedlings already established will give the balsam the upper hand in most stands, that is to say the balsam is to be treated as a sort of weed and all attention given to encourage the valuable spruce.

The general procedure to be adopted will be the marking out of the spruce seed trees over the proposed cut. The size of each cut area would depend entirely on its exposure. Well protected locations could be cut all at once. Wherever there was any danger of wind falls one could do the cutting at two different periods, say ten years apart, the first cut to be carried out along narrow belts irregular in figure and direction (due to topography and disposition of the timber) which would not give sufficient play-room to the wind. The whole section could be gone over the first time to remove all damaged and diseased trees, that is the decrepit and dying trees which would not survive ten years.

Particular pains would also be taken during cutting operations to make use of all merchantable fallen timber, so as to clean up the ground and decrease the chance of forest fires. The trees remaining after the cut, being healthy, would profit by the increased light; that is, they would produce more and better seed (besides laying on growth to themselves). A few years after the cutting, the young growth would be well established and one could remove, if one wished to, both the seed trees and the trees left as wind breaks.

Proposed Method of Operating and Regenerating the Jack-Pine Type of Forest

The Jack-Pine invariably comes up on burnt land, and it is doubtful if any other phenomena could bring about a successful regeneration. It is one of, if not the most rapid grower, and assures a supply of good pulpwood. The young stands are patchy and in places are so dense that one can hardly make way through them while all over one finds very thinly wooded spots occurring.

As the Jack-pine comes up after burning, it is necessarily even aged stands. The method of exploitation heretofore pertaining has been to remove trees over a certain diameter and this practice has in reality caused the removal of the fine trees while leaving the poor and smaller trees which, as a rule, have been growing in the denser stands and hence have been well supported on all sides, these are now bent down and broken by the wind, snow, sleet, etc. The loss due to the above cause is considerable.

I am of the opinion that the following outlined treatment will benefit the forest, by stopping the enormous waste due to the present method of cutting and at the same time it will greatly increase the natural wood growth. I am further of the opinion that in all dense groups of younger stands, that is, forty years and under, that a thinning should be carried out by means of a first or preliminary cut, which will remove the suppressed or choked trees and leave about 50% of the original stand. In the stands of over forty years, a general thinning should be done taking the fully matured as well as the suppressed or choked trees, thus leaving well set trees with good crowns to grow until the final cut takes place, in, say ten to thirty years.

Eventually the question of regeneration of these stands after the final cut will have to be dealt with, and it is more than possible that this will require to be accomplished by applying light and controlled burning to the areas, as certain soil conditions necessary for the germination of seed will be brought about by the action of fire, and the formation of ashes on the ground.

Proposed Method of Operating and Regenerating the Black Swamp Spruce Type of Forest

The Black Spruce in a swamp grows under very different conditions to the Black Spruce on dry soil, which is dealt with later, and yet it is one of the easiest types to handle.

The minimum diameter which the Quebec Government permit the lumberman to cut in Black Swamp Spruce is seven inches on the stump, yet I have seen many patches of swamp spruce remaining after the cut has been made where none of the trees reached the Government Minimum, hence, the lumberman was compelled to leave them to die.

This class of wood grows extremely slowly, and many trees one hundred and twenty-five years old will be found of only four and five inches diameter, while this type of tree will commence to wither and decay at about one hundred and fifty years.

The ground, of course, is marshy, and covered with moss. The development of this type of tree is very slow, as above pointed out, and the growth and decay are occurring simultnaneously, that is, the forest is reproducing and dying at the same time, young trees just coming up and old trees of one hundred and fifty years commencing to wither and die.

The Black Swamp Spruce is practically the only type where one finds a fairly even distribution of trees of all ages, and I advise the removal of trees on the age basis, as hereinafter outlined as the surest means towards actual regeneration.

I propose that this type of tree be treated by simply cutting trees over the average size of trees of fifty years of age in each stand, also that all trees which are sickly or damaged be removed.

One would thus minimize the loss of large quantities of timber, and aid the regenerative process.

Proposed Method of Operating and Regenerating Black Spruce in Dry Areas

This type of Black Spruce occurs mixed with Jack-Pine or even alone on dry moss covered areas. Black Spruce grows both in swamp as well as in dry places due to its power of existing on water containing very little oxygen, which condition is found both in the swamp and in dry areas where the moss or raw humus absorbs practically all the oxygen out of the rain water. Jack-pine thrives also in the dry areas.

One finds a certain amount of Jack-pine growing with the Black Spruce, but this Jack-pine dies at a much younger age than the Black Spruce which is slow in developing and is still relatively healthy even fifty years after the Jack-pine has ceased an active asset in the timber stand.

The dry area covered by the Black Spruce is comparatively small. For the time being I would propose a cut to remove mature and decaying trees, leaving a fair number of healthy trees per acre, mostly Jack-pine, which will be found growing among this Black Spruce, and which will be the following crop, and through which in its turn the Black Spruce will again propagate.

It has been noticed that after a fire this class of forest reproduces more rapidly and it may be found advisable at a later date to even go as far as applying light and controlled burning to these areas.

Regeneration of Old Burn. _(Mixed Woods)

At a first glance at these stands one would think that they were made up of nothing but Poplar and Birch. Upon looking more closely into them, one finds masses of young Spruce and Balsam coming up under this hardwood.

In the course of approximately forty years the softwood will force its way up through the Poplar and Birch.

Poplar has been used as pulpwood for a number of years and there is no doubt that Birch will be used for this same purpose where it can be done at a profit.

Restoring Our Lost Forest—The True Solution

By W. B. Greeley, Chief of the U.S. Forest Service.

Provision for a continuous and sufficient supply of timber in the United States is one of the real economic problems which must be worked out by the present generation. Three-fourths of our primeval forests are gone. Sufficient timber for the future can be assured only by the general reforestation of land which has been or is being logged.

The United States, like the nations of the old world before it, must pass from the mining of virgin forests to the harvesting of grown timber crops. We are a people of timber users, and in order to continue timber users, we must become a people of timber growers.

Need of Timber Recognized

The need for timber growing in the United States has never been recognized so widely as at present. It has been brought home perhaps most acutely of all to the millions or more average citizens who want to build their homes but have been unable to afford it.

It has been brought home to the newspaper publishers of the country through the shortage and high cost of paper. It has been brought home to the industries which look ahead for a supply of raw material and who realize that virgin timber is not much longer to be had even at the expense of heavy freight charges for long-distance transportation. More and more people are asking whether supplies of second growth are available, or if not, whether they can be grown.

Using Second Growth Now

As a matter of fact, we are already using large quantities of second-growth timber. There are considerable areas in the south Atlantic states and in the spruce forests of the northeast which have been cut over as many as three times. The box industry in New England depends almost entirely on second-growth pine for its raw material. But the critical point in the whole situation is that notwithstanding such instances, the United States is taking timber from its forests three or four times as fast as timber is being grown.

That is the problem in a nutshell. As against a steady shrinkage in the stocks of virgin timber, there are enormous areas of idle logged-off land, including millions of acres in Wisconsin, Michigan and Minnesota, and these idle lands are increasing by the millions of acres every year.

We are getting a haphazard second growth or, especially where forest fires are allowed to burn the logged-off lands, no second growth at all. If the economic necessities of the country are to be supplied adequately, the nation must find a way to bring about plan-wise reforestation on all cut-over lands suited to timber growth.

We have an abundance of forest land, not suitable or not used for farms, and are face to face with a shortage of forests.

Public Forestry Necessary

The growing of timber cannot be left to private initiative alone. It cannot be left wholly to the turn of profit or loss to the owner of the land under existing economic conditions. It is just the idea that the public should "leave it alone" that has led to the timber shortage now impending. The public interest must be protected through some form of equitable regulation of the use of forest lands to see to it that they are kept at work growing timber.

Forest Protection—A School on Wheels

(An Article from The Ottawa Citizen, May 4th)

"A travelling school in forest protection" in the novel from of a railway coach elaborately equipped with forest exhibits and graphic educational arguments for forest conservation was at the Central Station last night for a few hours and was visited by many leading citizens. Motion pictures were made of the car yesterday for the screen weeklies.

This makes the second railway car to be equipped at Ottawa by the Canadian Forestry Association and sent on the road for educational work. The car will be at Montreal two days, then will cover New Brunswick, later working through Quebec and Ontario. Mr. Gerald Blyth, Assistant Secretary of the Canadian Forestry Association is in charge of the present tour. Two weeks ago the Tree Planting Car of the Forestry Association left for the prairie provinces in charge of two expert demonstrators.

Blazing with electric lights, generated by its own plant, the interior of the "travelling school" attracted no less by its beauty and variety than by the novel character of the exhibits. A model woodland, with tents almost hidden by tiny trees represented the recreational side of forestry and played up the phase of forest protection especially appealing to the sportsman and tourist. Next came a graphic model of a pulp and paper town, done to scale, with mill, waterfall, river, pulp piles, etc., etc., as real as life. Electric-lighted cases showing many of the odd products of Canadian wood manufacture such as artificial silk, grain sacks, organ pipes, etc., with a series of models illustrating the reliance of mines, fisheries, fruit growing, etc., on forest materials were equally attractive. A large and accurate model of two maple sugar bushes showed the old and new way of making those luscious products which now bring the farmers of Quebec eight million dollars a year.

Further along came a set of model forests, illustrating the correct and incorrect methods of operating a timberland. Fire pumps, wireless telegraph sets, lookout towers, and an electrical illusion showing the transformation of a beautful woodland into a barren waste drew the attention of visitors. An exhibit of forest insects and another of distilled products of wood are very effective. At each of the hundreds of communities visited by the Canadian Forestry Association, motion pictures lectures are given in the evening.

Why Four Thousand ?

Within the loyal family of the Canadian Forestry Association are 4000 citizens of the prairie provinces.

Why are they members?

Mainly because the Association is giving positive service to the Prairie Provinces by developing tree planting.

Secondly because every member values highly the Illustrated Canadian Forestry Magazine. It is printed on coated paper, with plenty of pictures, and is non-technical. It gives more information as to tree planting on the prairies than all other publications combined. It is good to look at and makes easy reading.

The Canadian Forestry Association however is not merely a magazine-publishing body. It earns no dividends. It has no capital. Each member is a "shareholder" in an educational task that has a mighty meaning for the future.

We want you as a member to strengthen the Western work. We want you as a regular reader of the Forestry Magazine and its tree planting articles.

We will gladly send you a copy of the book "Tree Planting on the Prairies", and will render you every aid in establishing a tree belt about your farm or home.

Here is a typical opinion of the Canadian Forestry Association. It comes from the United Grain Growers, Winnipeg.

"The Directors appreciate the splendid work which is being done by you and are individually doing what they can to assist it."

OUR WESTERN DIRECTORS:

Alberta:

NORMAN HARVEY, G. P. MARNOCH,
WM. PEARCE.

Saskatchewan:

HON. W. F. A. TURGEON, JOHN DIXON,
JOSEPH GLENN.

Manitoba:

G. W. ALLAN, M.P., EDWARD FITZGERALD,
J. W. DAFOE.

Value of Quebec's Private Forests

According to an official tabulation of the Quebec Government, the privately-owned forest areas of Quebec, obtained originally from the Crown as grants for colonization purposes to seignories as well as lands granted to settlers and to railways, represent a value estimated at $30,000,000 and comprise roughly 11,400 square miles. From incomplete data, taking into consideration the maple groves, orchading, the pulpwood and fire wood output, the annual value of the products is placed at $7,000,000. The great bulk of the pulpwood, which is annually shipped to the United States for the maintenance of American paper factories, comes from these freehold forests.

ANNOUNCEMENT!

Commencing June 1st, The Illustrated Canadian Forestry Magazine

will issue in a new style, which the editors believe will gratify all readers and advertisers.

The size of the page at present is 6¾ inches wide by 10¼ inches deep. The new page will be 9 inches wide and 12 inches deep, a very substantial change as you will probably agree.

Each page will be three columns wide instead of two. The illustrations and type matter will be much improved and the cover pictures will show up to better advantage.

The magazine will open flat and all advertising will be grouped effectively in the back pages.

We want the Illustrated Canadian Forestry Magazine to please **you**, and we hope you will agree that the June issue takes a step in that direction.

From a Canadian Who Puts His Patriotism To Work

Annapolis, Royal, N. S., April 20th., 1921.

Mr. Robson Black, Secretary,
Canadian Forestry Association,
Ottawa, Ont.

Dear Mr. Black:—

I am duplicating my subscription of last year to the Canadian Forestry Association, and am enclosing my cheque herewith for $1,000.00, payable at par at any branch of the Royal Bank of Canada, to cover amount of same.

The small amount of snowfall of the past winter will probably mean low water and consequent dry conditions in the woods the coming spring and summer. This, with the enormous amount of dead dry trees which were killed by the spruce bud worm will increase the fire hazard to an extent greater than ever known in the history of timber lands in the Province of Quebec and New Brunswick, and I would urge upon all railroads, Forest Fire Protective Associations and the public in general for increased vigilance in the prevention and protection of our forests from destruction by fire. This is something that every man, woman and child in Canada has a personal interest in, as every mature forest tree that is killed means a matter of one hundred years to replace.

The Canadian Forestry Association is doing such good work that I feel it should have the hearty support of every citizen of Canada, and there never was a time in the history of Canada when the protection of our forests was of greater importance.

FRANK J. D. BARNJUM.

"CANNOT BE MEASURED IN DOLLARS AND CENTS"

"The Canadian Forestry Association has proved itself in the foremost rank, as an agency for impressing on the public the importance of Canada's forest resources and the absolute necessity of providing adequate protection. The association through its magazine, by lectures, the exhibition of moving pictures and by the use of demonstration cars, and through the medium of the public press as well as by direct appeal by bulletin to its members and by posters to campers and fishermen, has done the Canadian people a service which cannot be measured in dollars and cents."

Can. Pulp and Paper Magazine

Fruit Growing Follows Prairie Tree Planting

(A letter in the Farmers' Advocate)

Coming to Alberta from a wooded country, I naturally missed the trees very much in the beginning, and in the springtime, when it was time for trees to leaf out, I used to travel ten miles on Sundays to the banks of the Bow river, the only place where trees ings, and I no longer need to travel a long way to see trees.

My trees were planted from 1911 to 1913, and, in fact, I have planted some every year since, and the Government tree inspector tells me that I have the best grove in Alberta. This, however, may not be saying much, as there are few good ones.

In my own district there are about a dozen groves doing more or less well, and I might state, that every grove that is reasonably taken care of is doing well.

My own experience has proven that Manitoba maple, green ash, caraganas and Russian poplar are the most dependable trees for this district. In my first plantation I planted some willows and cottonwoods that made a quick growth for the first few years and then died. The only kind of willow I find that will keep on growing is the red willow. I also have a couple of hundred evergreens growing, all doing well, but my experience with evergreens is that they are very hard to pull through the first couple of years. I think about 50 per cent. of them died. Inside the shelter belt I have a number of lilacs planted, doing well, and last year several of these flowered. But my greatest pride is a miniature orchard enclosed by a shelter belt. In this orchard I have several kinds of plum, cherry and apple trees growing. The plums are Manitoba wild plums, the Cheney plum, and the Opata, a sort of hybrid. Nearly all of these plum trees were loaded with fruit last year, and while most of the plums are a little tart, they make fine plum preserves. Last year I also had bushels of sand and compass cherries, and a few crabapples. From my own experience I am prepared to say that every farmer in this district, at least, can raise his own small fruit and a good deal of the bigger fruit. For the past five or six years I have grown all the strawberries, currants, gooseberries and red raspberries the family could use during the growing season, and also enough for preserves to last through most of the winter.

Alta. JOHN GLAMBECK.

Good Work, Calgary !

A carload of trees has been ordered by the special Arbor day committee of the various public organizatoins of the city and will be placed on sale at Ninth avenue and Second street west, immediately behind the Canada Life building, as soon as they arrive. They will consist of balm of Gilead, spruce and poplar, are from good, healthy stock and are from six to eight feet high and well rooted.

Every purchaser will be supplied with a printed list of instructions, and amateur gardeners need have no hesitation in the matter of purchasing, for they will be given every assistance by W. R. Reader, the parks superintendent. The trees will cost about 75 cents each, the prices, of course, depending upon size and grade. For those who cannot take them away with them a delivery system at small cost will be arranged.

—From Calgary Herald.

Goats as Money Makers.

Vancouver, British Columbia.—British Columbia now has 5,000 goats within her boundaries, with an estimated value of $200,000. The production of milk for 1920 is estimated at 75,000 gallons, which at 15c. a quart is valued at $45,000. If to this sum is added the value of the 1920 crop of kids, which is about $25,000 more, the value of the goat industry in this province during the year 1920 is placed at $70,000. Three years ago the estimated number of goats in the province was one thousand.

Worthy Directors Called by Death.

The Forestry Magazine chronicles with regret the death of Honourable Sydney Fisher, who was President of the Canadian Forestry Association for 1917 and of Mr. George Y. Chown of Kingston, Ontario, President of the Association for 1911. Although both were closely occupied with a heavy programme of affairs, public and private, their duties as Directors of the Canadian Forestry Association were fulfilled with great fidelity and enthusiasm. The Association gained greatly by their wise advice and encouragement during the many years when public recognition of the claims of forest conservation was to be won only by patient and persistent educational effort.

Ontario and Quebec Strive to Solve Forestry Problems

By Edward Beck.

The disposition to regard the forests as mines to be exploited to the limit and despoiled without restraint, or as a reservoir of wood to be emptied of its contents as quickly as possible, is no longer tolerated anywhere. The tendency now is to look upon them as a crop, capable of being made to yield a continual harvest. The exact means by which this is to be accomplished is a matter for trained foresters. It is, furthermore, a matter in which co-operation between the Government and the private interests is essential and one in which the people, as represented by the Government, have a vital interest, and must be prepared to give it adequate financial support.

The first obligation is, without question, to improve and extend our present methods of fire protection or prevention. When one considers the enormous losses that occur every year from preventable forest fires, it seems almost foolish to talk about cultivating new forests. It is encouraging to know that great improvements have been brought about in recent years. Education is doing its part. Larger appropriations by the provincial governments have resulted in the employment of a more numerous army of fire rangers. Radio communication and the aeroplane are making it easier to detect and stamp out incipient fires. Eventually, fire losses should be reduced to a minimum, if not entirely eliminated.

Tied up with proper fire proper protection is, of course, the question of slash disposal upon which practical foresters are still not all in agreement. Insect pests and parasitic fungi also constitute a forest menace calling for extermination.

These problems, however, are all but part of the all-embracing one of how best to harvest our standing timber, with a view to meeting present necessities and providing for future requirements. This is the problem that should engage everyone concerned with forest administration.

Ontario has recently undertaken a reforestration programme of its own. Its outcome will be watched with keen interest by the other provinces, especially as in some of its aspects it marks an entirely new departure.

In Quebec, the Government is taking active steps to get the large companies to place their holdings under the management of trained foresters, and to work more closely with the authorities in operating them on the basis of obtaining a sustained yield. The proposal there is to take an exact inventory of the provincial forest resources, upon which the Government engineers and those of the limit-holders will co-operate in the preparation of a forestry programme to embrace a term of years. The system proposed aims at preserving the forests, and, by the use of selective cutting, to leave them with an increased value, doing away entirely with indiscriminate cutting, which impairs, when it does not destroy, the forest capital. In other words, an effort will be made to adjust the annual cut to the estimated annual growth. Quebec is also getting ready to establish a school of rangers in connection with its forest nurseries.

From a noted Toronto architect:

To Canadian Forestry Assoc.

"I send you with much pleasure my subscription of two dollars — all too little — to the Canadian Forestry Association, with warmest congratulations on the fine work you are doing. You can count on me for 1921, 1922 and all the succeeding years as long as I am neither dead nor "bust".

"It is difficult to find words to express adequately the value of your efforts towards preventing the terrible annual loss of our forests by fire, and in educating the Community to the necessity of reforestration.

"It is always uphill work opening the eyes of the public to evils to which they have become accustomed, but it really does look as though they had been awakened at last, largely through your work.

"I wish also to congratulate you on the argument put forward at the end of your leaflet on the necessity of keeping the Association free from Government or commercial control. This is essential, for the moment the Government or any commercial interest gets hold of your Association, that moment its value comes to an end and you can count me out."

The Methods of Sweden

H. M. Meloney
Fellow of the American-Scandinavian Foundation.

As in many other older countries, the people in all walks of life as well as the government have fully awakened to the great value of the natural resources. Crown forests have been set aside to be carefully watched over by trained foresters of the State Service, and a policy for the development and use of wood resources has been formulated and put into practice, the keynote of which is that the mean annual cut shall not exceed the mean annual increment. About 40 per cent of the forest area is included under public ownership.

The Swedish Institute of Forestry has been erected upon the outskirts of Stockholm, and with its efficient corps of instructors and modern equipment is turning out each year an excellent type of trained forester. Adjoining the school is the Swedish Station of Experimental Rereach. These institutions are greatly augmented by the provincial forest schools, and the Swedish Forestry Association, which carries on a nation-wide forestry propaganda.

The country's three greatest assets, namely, timber, waterways and iron, are so closely interrelated that it is impossible to write of one without giving mention to the other two. The drainage system slopes toward the southeast from the Norwegian border to the Baltic Sea. The ice on the rivers melts in the spring from mouth to source, and thus excellent floating ways are formed, affording quick and cheap transportation to the large export sawmills located near the mouths of these streams. The hydroelectric possibilities are already developed to the point where nearly all sawmills and pulp and paper mills are electrically driven, and with very complete plants for the electrification of the national railways, another cheap and efficient means of transportation shall be provided. Much of the latter has been accomplished, and it is of interest to know that lighting and telephone systems have been installed which reach the most remote dwellings. A great step in a land where part enjoys but five hours of daylight in the winter, and the rest must endure the long Arctic night. Is it any wonder that the people take an individual interest in seeing that the vast watersheds are kept under forest cover, in order to protect and regulate the streamflow for the generation of power?

Private Ownership.

Sixty per cent of the forest area of Sweden belongs to private owners. It follows, therefore, that private forestry is of great importance. In the past many of these privately owned areas have not been managed in a way conducive to the conservation of the timber. In some parts of the country the rights of owners have been limited by special laws as a result of which the supply of standing timber has been preserved. This is especially true in the Lapland districts. At the present time approved forestry methods are practiced with success by nearly all the large timber owing companies. The government limits the annual cut to equal the annual increment. This assures not only a future timber supply to the country, but also a better stand than that existing at the present time, since a proper silvicultural system must be followed in cutting. Some clear cutting is practiced, but, in general, medium thinning over large areas is the most common method of removing the standing timber. All cutting operations, on private as well as public lands, are carefully supervised by a trained forester.

The trees marked for felling, unless of unusual dimensions, are felled in the winter by one man, instead of by two, as is the general custom in this country. The manner of cutting the stumps nearly on a level with the ground is followed to prevent waste, and the tops and limbs are cut and piled for fuel wood. In many cases the stumps are removed in the summer, when the ground is soft, and considerable revenue derived through their use for tar and charcoal burning. After trimming and bucking, the logs are yarded by horses and then transported by sleigh to the nearest stream, where they are piled to await the spring drive. In a very few cases, caterpillars, steam skidders and logging railways are in use, but only where clear cutting has provided a sufficient quantity of logs to warrant the expense. Operations are carried on in the usual slow European fashion, and many instances were noted where a little American ingenuity would have done away with much unnecessary labor and sped things up.

A New Fuel from Waste-Wood

H. C. Diers, an American industrial engineer, has perfected a new commercial process for converting the waste wood from lumber mills and waste liquids from paper pulp mills into a new fuel, which he calls lignacite. Mr. Diers has been working on the process for several years.

With an improved system of retorts and rollers the raw waste wood from the lumber mills is hogged, then put through a process of carbonization, the residue treated with sulphide liquor under temperature, and by a system of compression made into layers, the same as a coal vein. When the prepared bed of fuel is cooled it is broken and is ready for use. The fuel resembles coal but is lighter in color. It is claimed that the cost of making this fuel is a great deal cheaper than the making of coal briquettes. An important feature is the fact that there are valuable by-products which largely pay for the process.

This new fuel is practically a pure carbon, having less than 2 per cent ash and no volatile matter, moisture or sulphur. It makes an intense heat, and it is claimed that it is adaptable for all metallurgical purposes, is absolutely smokeless and stands handling and weather conditions. A test of the fuel was made in one of the iron works on Coos Bay and as a heating agent proved to be equal to the best Eastern coke.

Speaking of his invention, Mr. Diers says: "The Pacific coast states at the present time produce less than 150,000 tons of low grade coke. All of this is made in the state of Washington and consumed in local smelters of that state. The states of the Pacifiic coast, for all metallurgical purposes, consume over 750,000 tons of coke annually and 80 per cent of this coke comes from the eastern states at a cost of millions of dollars annually. With the new process fuel the future supply of metallurgical fuel for the Pacific states is in the hands of the lumber mills and paper pulp mills, as they have the products to make the fuel and are now wasting those products."

The daily attendance at the Canadian Forestry Association's two railway cars, Eastern and Western, this year is breaking all records. Arrangements have been made to attach the Western car to the Better Farming Train sent out by the Saskatchewan Government.

Hands across the Boundary !

From the Schroeder Mills and Timber Co.,
Milwaukee, Wis.
(Referring to the educational enterprises of the Canadian Forestry Association)

"We believe this is a very worthy cause and should have both our moral and financial support. I know personally of the great deal of good which has been done along these lines in the Pacific Northwest, and I can also say from experience that the Canadian people who travel the bush are not fully alive as yet of the deadly menace to their interests which is presented in the way of carelessness with fire while in the woods. I hope that some day conditions in Ontario will be as good as they are in Oregon, Washington and Idaho, where the actual timber loss by fire during the past 4 or 5 years has been very small, and what losses they have sustained have been caused by conditions well beyond the control of human beings."

An Association Supporter

From: D. & J. Ritchie and Company,
New Castle, N. B.

Enclosed please find our cheque for $5.00 being amount of Contributing Membership to your association, as well as covering subscription to the Canadian Forestry Magazine. We might say that we are pleased to receive the Magazine from month to month and enjoy reading it from cover to cover, as there is always sure to be a vast amount of valuable information contained therein, and it is nicely written as well. We also realize what a vast amount of good the Association is doing in an educational way in promoting the conservation of the Forests, and we are glad to give what little assistance we can from time to time.

A Patriotic Company

No company is rendering better or more independent service to the cause of forest protection than the Roberval-Saguenay Railway, Chicoutimi, Quebec, of which Mr. J. A. Vallerand is General Superintendent. The Company has issued a series of instructions to their employees which show the fullest appreciation of the importance of fire prevention and an exact knowledge of methods for their prevention.

Results of the Prairie Tree Planting Campaign

The following letter has just been received from our Western organizer, Mr. Archibald Mitchell, who with Mr. Angus Cooch, is carrying forward our Tree Planting Campaign in Alberta, Saskatchewan and Manitoba, with the aid of our Tree Planting Car.

"The Tree Planting Car"
En Route—Cardston, Alta.
May 2nd, 1921.

Well, we are off to a good start and already we are seeing results from our last summer's tour.

Calgary is in the middle of a great planting campaign where the Board of Trade, the Kiwanians and the Rotarians have joined forces and are putting over the biggest planting campaign over, this Spring. We were at the committee meeting and found a bunch of enthusiasts indeed. Several carloads of trees will be planted by the citizens of Calgary this year.

Then the small towns are not behind hand. Vulcan, enterprising as usual, is boulevarding her streets, as well as planning a new children's park.

Champion again is another tree planting town. A new park and the re-modelling of the school grounds being under way. At both places we supplied plans for the parks and other information which seemed to be appreciated.

Nor are the farmers behind hand.

Roy Walker of Vulcan, a member of the Association, is planting a mile and three quarters of shelter belt, ten rows wide this year and is planning for two miles more next year. No more soil drift for Mr. Walker if he can help it.

We went out to his place and they kept us busy; what to do with the currants, the raspberries, the Russian Poplars, the most effective places to plant shrubs, what to plant, and so on. Half of his plants this year will be cuttings so we had to visit the smith and show him how to make a cutting-planting iron. Three hours after, when the afternoon lecture was over, we called on the smith to see if the iron was up to specifications but found it was finished and already half way to the ranch.

At Lethbridge we found a busy campaign of tree planting on under the energetic leadership of our good (and big) friend, Peter Lund. "A tree for every citizen" is the slogan at Lethbridge this year, and all hands are busy.

At Cardston we found the proportion even higher, for a town of 4000 is planting 6000 trees. Their streets are being boulevarded, a new park, the grounds of the tabernacle and of the temple are all being planted and tree planting is in the very air.

The park is to have a band stand and lots of open spaces with clumps of trees and shrubbery for shelter in stormy weather. Our island system for the small town park is being used and they will have a fine asset to the town in a very short time.

Our route takes us next over another section of the soil drift country and then south to the boundary, into a district where some of the school children have never seen a tree. Our pictures should introduce them to an entirely new world.

Yours very truly,
Sgd. ARCH. MITCHELL.

The Hickory Supply for Autos.
(Editorial, American Lumberman)

In talking to an automobile salesman recently about the superior qualities of wooden wheels for automobiles as compared to wire wheels, he rather dolefully said that the public would have to get used to metal wheels soon, for it is now almost impossible to get the hardwood with which to make such wheels. I am wondering if this is correct or has some propaganda been circulated recently against the wood auto wheel?—Inquiry, No. 206.

[Hickory is one of the best woods for automobile wheels, and there is no immediate danger of the exhaustion of hickory. So far as can be judged from present conditions, it will be one of the last woods of this country to fail in supply. Much is used for handles and vehicles, but it grows rapidly. It is at least as much of a domestic tree in its habits as black walnut, and grows along fences and in old fields where it is at its best. It is peculiar among woods in that the faster it grows, the better it is. Second growth—that is, fast growing, hickory—is preferred for many purposes. The wide rings of spring wood which are found in open ground hickory trees, give a strength and toughness, exactly what is desired by makers of vehicle wheels. It will be a long lime in the future before automobile makers can not get wood for wheels if they want it.—Editor.

What Comes of Tree Planting

By Arthur Herbert Richardson

When settlers first came to this continent, they found limitless tracts of forest, waiting to be subdued. Trees were man's common enemy. They only prevented him from reaping the fruit of the soil, and in the competition to subdue the forest, many thousands of acres of land were cleared which were meant only for tree growth. This has been demonstrated in an interesting way throughout many parts of New England. One finds there to-day more forested land than there was fifty years ago. The reason for this is that when the Western States were being settled the young people left the New England farms for more fertile plains and valleys. Fields once used for crops were seeded by trees, with the result that many fine stands of timber have grown up on land which was meant only for their kind.

Planting 100 years ago

With such a wealth of timber on this side of the ocean, it is scarcely to be wondered at that reforestation has not until recently met with any great sympathy. However, early in the last century there are evidences that men with a wide vision realized what would happen if the exploitation of timber areas was not supplemented by planting. The period between 1820 and 1880 was one of enthusiastic planting of pine in New England. People foresaw that the time would come when White Pine and other species would be gone and it would be necessary to plant if such timber was to be available. Large plantations were set out by private owners and a few corporations. In most cases the young trees were dug up in the woods and planted either at random or in rows 5 to 12 feet apart. In some cases seed beds were made and in others the seed was sown broadcast. At the end of this period it was estimated that there were in Massachusetts alone plantations of White Pine to the extent of 10,000 acres. After this period interest in planting began to decline, chiefly because of the immense supplies of lumber that were being brought from the region of the Great Lakes and also a lack of adequate fire protection in New England. These two factors tended to dampen the enthusiasm for forest planting.

It was the pleasure of the writer to visit some of these older plantaitons in Massachusetts during the past year and the results observed were very encouraging. I remember talking to the owner of one of these plantations, an old man in his seventies. As we chatted he told me how at one time the site had been occupied by a peach orchad. The peach trees kept dying and as the soil was not the best for crops, his father had set it out with trees. He remembered the date well because it was a half holiday in honor of the completion of the laying of the transatlantic cable and his uncle had come down from Boston to help with the planting. That was in 1858. To-day he has a beautiful stand of White Pine. People often argue — very selfishly — what is the use of planting trees, the one who plants them will never reap the benefit! The foregoing is an answer.

But our chief concern at the present time is our own province of Ontario, and when considering the problems with which we are faced, it is well to compare what other countries have done under similar circumstances. The most noteworthy examples of reforestration are to be found in France, and any country planning to undertake tree planting on a large scale can find in the work done in that country a parallel condition to its own. If it be reforestrating on steep, rocky formations for watershed purposes, consider the work done in the Cevennes Mountains; if it be sand dune areas where tons of earth are moved according to the humour of the wind, study the sand dune fixation work on the shores of Gascony, or if it is desired to grow a crop of trees on otherwise unproductive soil, compare the tree planting carried out in the district known as the Landes. It will be interesting to outline briefly reforestration work which has been accomplished in these different areas and to compare the conditions and what might be accomplishments on similar areas in Ontario.

The Cevennes Mountains are characterized by steep, rocky slopes that give rise to many torrential water courses. Originally these mountain sides were covered with timber and for many years the French government enforced regulations prohibitting the cutting of trees from such areas. After the French

Revolution, when things became more or less disorganized, these areas, which before had preserved the stream flow, were exploited, with the result that after ten years of such work the effects began to be felt in the valleys below. It is estimated that 8,000,000 acres of tillable land were made useless due to this ruthless cutting which meant that hundreds of people had to leave that section of the country. The French government then put a stop to this cutting and commenced reforesting these slopes. This was a difficult task, for in many cases water courses had to be built up with masonry and cribbing, before trees could be planted. But the work went on favorably until in 1900 there had been expended on this enterprise, $13,000,000, and at the rate it was then progressing it was estimated that it would be completed in 1945.

Ontario's Problem

The only section of Ontario which can be called similar to this area, and yet it is very different because there are no mountains in Ontario, is the northern part of the province which is largely Laurentian formation, characterized by outcroppings of rock with here and there pockets of good agricultural soil. The problem in this section of the province at the present time, however, is chiefly one of protection.

The Gascony area is in the southwest part of the country where there were 250,000 acres of sand dunes which had endangered the adjoining pastures and fields. Here the task was to stop moving sand, and in many cases special barriers had to be built in order to retard its progress. But with rare patience the work went forward until 200,000 acres of this area had been reclaimed, which in 1907 was valued at $10,000,000. In Ontario there are three areas which are comparable to this one, namely, a part of Prince Edward County; sand dunes in Lambton County, and similar areas in Norfolk County, altogether they would aggregate possibly 8,000 acres of land and there is no reason why these sand dunes in Ontario cannot be reclaimed and held, as well as to be made produce a valuable forest.

The third area is known as the Landes and is a triangular piece of country in Gascony containing 2,000,000 acres of moving sand and poor stagnant soil, the only inhabitants before it was reclaimed, being a number of poor shepherds who went about on stilts attending their flocks. Of this area, 1,750,000 acres had been reclaimed before 1907 and where there was once a desolate plain in which it was hardly fit for a human being to live, there is now a forest of beauty, estimatted at $100,000,000 in value, and supplying work and substance to hundreds. The work carried on in this section of France and the natural conditions to be combatted there are most comparable to the work of reforestation that might be carried on in southern old Ontario. Areas of this kind in the province are plentiful enough and yet altogether the separate large areas do not total more than 200,000 acres.

How Germany Will Pay for Forests

At a hearing recently before the Reparations Commission in Paris, on land and orchard damages, Germany contended that it was incumbent upon Germany to pay the proportional cost of replanting orchards, which should be determined by the difference between the stage of the tree when destroyed and the normal life of the tree according to an official announcement.

Germany recognized that compensation was due for the destruction of forests to the value of the wood destroyed or carried away and also for reforestation, provided the felled trees were of no commercial value.

From a U. S. Forester

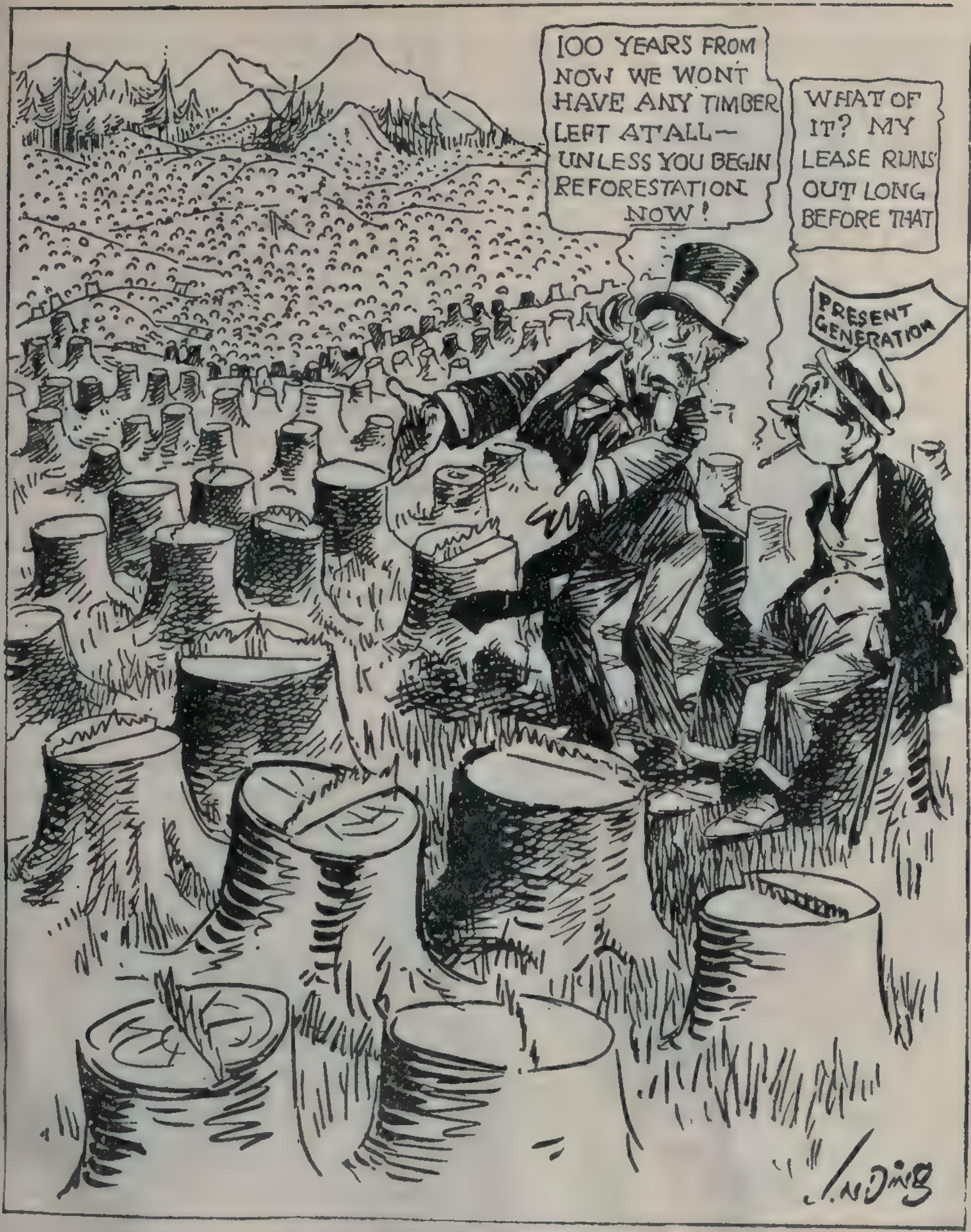
To Canadian Forestry Assoc.

I am enclosing herewith check in the amount of $4.

Kindly permit me to compliment you on the excellent work which it is apparent your Association is performing in the interests of forestry.

I do not think I am guilty of exageration in stating that your activities along this particular line are far ahead of any organization that we have in the States.

With best wishes for your continued success, I am,


100 YEARS FROM NOW WE WONT HAVE ANY TIMBER LEFT AT ALL— UNLESS YOU BEGIN REFORESTATION NOW!
WHAT OF IT? MY LEASE RUNS OUT LONG BEFORE THAT
PRESENT GENERATION
J.N. Ding

As the New York Tribune sees it.

ONTARIO'S PULP LOGS PUT 11 MILLIONS INTO PAY ENVELOPES

It has been stated (and without exaggeration) that every citizen of Canada owes his job to the Forest, that no man whether packing peaches, feeding a printing press, or teaching school can long continue his existence denied the multitudinous services of the common log of wood.

In Ontario, the vast development attributable to the lumber industry is known and appreciated. What strides have been made by the younger brothers of the wood-using industry, pulp and paper, are not so well understood.

Ontario possesses 16 paper mills, 9 pulp mills, and 13 combined pulp and paper mills, a total of 38 establishments out of 99 in the entire Dominion. They represent a capital investment of $95.281,000 out of a total of $264, 581,000. They give employment to 8,571 persons, exclusive of woodmen. They distribute in wages and salaries $11,666,000 a year, out of a total of $32,323,789 for the whole of Canada.

Two of Canada's greatest paper producing mills are in Ontario: the Spanish River Pulp and Paper Mills with three plants at Sault Ste-Marie, Espanola and Sturgeon Falls, having an ultimate annual output, when new machines are completed, of 200,000 tons of newsprint paper, 10,000 tons of surplus groundwood pulp, and 13,000 tons of surplus sulphite pulp and 10,000 tons of box boards; the Abitibi Power and Paper Co. of Iroquois Falls, one of the largest and most efficient paper mills in the world, with an annual capacity of 120,000 tons of newsprint, 18,000 tons of board and 18,000 tons of chemical pulp.

Too much emphasis cannot be given to the influence of Ontario's pulp and paper plants upon agricultural settlement. Each industrial unit creates a municipality of thousands of people paid at high wages and demanding for more farm produce than the settlers in their immediate neighborhoods have yet found it possible to supply. Markets near at hand and the first essential to land settlement in Ontario's northerland and such markets are being supplied by the pulp and paper towns and to a lesser degree by the mining camps. The Forests of Northern Ontario, therefore, must be regarded not only as a creator of prosperous municipalities in what was yesterday's wilderness, but equally as the builder of markets without which the pioneer farmer would find conditions hopeless.

The House Jack-Pine Built

By T. K. D.

Who is Jack Pine? What is Jack Pine? Where is Jack Pine?

From the investor's standpoint; from the pulp and paper producers' standpoint and from the national standpoint, Jack Pine is quite a big fellow in his own particular way.

For generations of tree life, jack pine has been a sort of poor relation. It has been the reckling of the timber breed. But henceforth it will be quite an important member of the forestry family. Heretofore, jack pine has had a very indifferent place in the assets of the producing companies; it has had no place at all in the active operations. It has been used for the extraction of certain chemical properties, for railway ties, and for kraft wrapping paper — not a big market as timber markets go. And there are scores of millions of cords of jack pine. The woods are full of them, so to speak.

Jack Pine, alias Banksian, alias Cypress, in the past has been a stubborn and reluctant servant of the pulp and paper mill; so much so that the expert woodsmen and mill operators deliberately ignored it as a means towards the end of pulp and paper making. Operators occasionally, inadvertently or with aforethought, put jack pine into the stewing pot with the more respectable spruce and balsam, and always there was trouble — mostly pitch trouble. Jack pine, being a self-confessed culprit, was relegated again and again to the tall timbers.

Jack pine, it will be observed, has had a very bad name, and as a consequence was not invited to the daily dance of the woodchips, or the jamboree in the mill digesters.

Jack's reputation improves

Now we find that Jack Pine is not at all the sort of chap we thought he was. He has been exclusive, that is all. He can go into the digester, unaccompanied, and come forth a one-hundred-per cent. specimen of sulphite pulp, equal to the best composition requisite for the making of good and sturdy newsprint.

And this is the point: :Most of the companies in which investors are interested have supplies of jack pine to the extent of 15 to 35 per cent. of their standing timber areas. Most of these companies, in appraising the value of their physical assets, write the jack pine timber at, perhaps, less than one-half the value placed upon the timbers ordinarily used for the manufacture of pulp and paper.

My information is to the effect that in the Abitibi and the Mattagami companies'

ELECTRIC PLANTS FOR EVERY SERVICE

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The Plant is 32 volt and has a capacity of 32 lights direct from the generator or 67 lights for five hours when combined with TITAN 216 ampere hour battery.

Complete stocks of 32 volt belt driven or direct connected plants and standard wiring material always on hand at our Houses.

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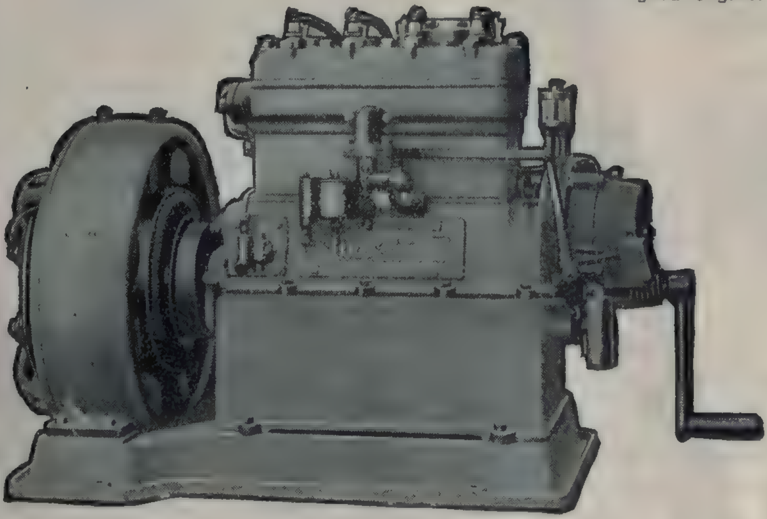

110 Volt D.C. Universal Plant.

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areas, for instance, jack pine represents over 15 per cent. of the standing timber. Riordon, Price Bros., and North American Pulp run from 10 to 15 per cent. Brompton appears to have none. The St. Maurice River territory has 20 to 25 per cent. of jack pine, while this timber on the Spanish River properties predominates all other classes of standing pulpwood. In the Upper Ottawa district, there are some 20 million cords of pulpwood, with jack pine giving an additional 3 to 4 million cords.

Thus, the available supplies of timber for newsprint production is some 15 to 25 per cent. greater than has been estimated by the companies operating the areas. To put it another way, it has been estimated that the Province of Quebec has 155 million cords of paper-making timber. With the addition of jack pine the available resources will be increased to 185 million cords.

From experiments recently made, and successfully concluded, by commercial as well as laboratory practice, the fibre from jack pine was found to be about 25 mm. longer than that of spruce fibre, which makes it particularly suitable for newsprint. The pulp made from jack pine, when treated alone, proved to be as good as, if not better than, anything that can be purchased on the market.

Will cheapen operations

Therefore, it is possible for those companies which in the past have been compelled to leave large areas of standing jack pine and cut further and further afield from their mills, to begin afresh near the source of manufacture, with several seasons' run of the near-by product, and thus reduce the average of the cost ratio by a very substantial and profitable margin. The clearing of those areas will also make available the shut-in-balsam and spruce not economically workable in the past.

The additional advantage in respect to jack pine as a newsprint producer is in the fact that the tree grows more rapidly than any other conifer. As a rule, it is peculiar to dry and sandy soil. Its powers of natural reforestration, after fire, are greater than any other conifer. On the average, jack pine attains twelve inches diameter whilst a spruce grows six inches in the same period of growth. There are more cords per acre, on a given area of jack pine, than there would be even in black spruce, which probably has the speed record to date.

Incidentally, besides those companies already mentioned, Laurentide is high in jack pine holdings. The Provincial Mills and the Belgo Canadian also have a high percentage of jack pine.

The causes which have kept this valuable timber from a practical consideration are: a remarkable degree of ignorance; much prejudice; a modicum of laziness, and, no doubt, the fact that only too often is Invention still-born when Necessity has no need to function.

Clearly, the scientific and chemical resource which has brought jack pine within the scope of the paper-maker, has given to Canada's forests a renewed lease of life; while to investors has accrued an unexpected increment in the shape of increased physical assets, where a decrease might reasonably be expected through seasonable depletion of the reserves of what to date have been considered the only timbers suitable for paper production.

Jack-Pine, no doubt, is quite warranted in assuming the hyphen therein placed, which nowadays joins achievement to greatness.

A New Lookout Station

The New Brunswick Forest Service has constructed another lookout station this year on the Tobique watershed which overlooks 2,000 square miles. It has been built by the Forest Service in co-operation with the Fraser Companies, Ltd. and the New Brunswick Railway Company.

Ontario's reorganization

Hon. E. C. Drury, Premier of Ontario, stated in the Legislature on April 25th, that a reorganization of the Department of Lands and Forests was in contemplation and would come probably within a month.

Our Empire's Timber

It is estimated that the British Empire possesses about twelve hundred million acres of forest lands and that only one-third are economically productive.

To the Canadian Forestry Ass'n,
Ottawa, Can.

"Judging from results already obtained your future activity will be marked with the continued success you so well deserve."

J. R. BOOTH, Ltd."

Everybody Smokes

OLD CHUM

CANADA'S FAVORITE
PIPE TOBACCO

Developing the Empire Forestry Association

In July, 1920, the Imperial Forestry Conference held a session in London, which was attended by delegates from various parts of the British Empire. The result of their deliberations was to confirm the view that, speaking generally, the Empire is dissipating the enormous natural resources which it possesses in its forests, without making provision for their renewal; while such vital matters as the yield and utilization of timbers, the management of forests, forest education and scientific research are being neglected. The members of the Conference were also convinced that the administration of all our forest departments must be strengthened if the desirable policy of conserving and regenerating the forests of the Empire is to be effectively pursued.

State of Forestry in the Empire

A Special Committee of the Conference, appointed to outline a scheme for a British Forestry Bureau, drew pointed attention to the unsatisfactory position of forestry, and after explaining the scope and objects of such a Bureau, it concluded: — "We have not been able to ascertain precisely to what extent existing institutions in the United Kingdom and other parts of the Empire are attempting to deal with the problems of afforestation, but we do know definitely that these need to be tackled. The important matters with which the proposed Bureau would deal are at present in a chaotic state."

Recommendations of Conference

Among the recommendations of the Imperial Forestry Conference are some which obviously fall within the province of government. Institutions for scientific research work, or for the training of forest officials, can only be undertaken by the State, and should not be left ot private or non-official enterprise. But in other directions, indicated in the resolutions of the Conference, there is much to be done by volulntary agency, notably the work of publicity or propaganda.

Delegates to the Conference laid stress upon the need for a sustained effort to interest the community in forestry. This lies outside the purview of an official forestry department; and they pointed out the disadvantage of propaganda work being carried out by either the State or by a purely commercial association, interested, perhaps, financially in some particular forest industry. In the former case the character or policy of Provincial or State Governments in the Dominions may debar Federal action, while, as regards the latter, information or exhortations emanating from an interested source would arouse suspicion.

Value of Forestry Associations

On the other hand, there is direct evidence of the immense scope for voluntary forestry associations, which have no particular trade interests to foster, which are not officially subordinate to, or leagued with, any government, and are free to support or criticize, as the occasion may demand, the official forestry policy, or the lack of it, in the United Kingdom, Dominions or elsewhere. The great voluntary associations in Canada and Australia have greatly assisted in spreading correct knowledge as to the growth of trees, sylvicultural methods, and the production of timber. While in the U. S. A. they have intervened with effect in controversies connected with "conservation" and forest reserves.

Need for Central Association

The experts at the Conference were unanimously agreed that the time has come to establish a Central Forestry Association for the following purposes:

(a) To serve as a link between the associations already existing in the United Kingdom, Australia, Canada and other parts of the Empire, and between individuals engaged in the work of forestry;

(b) To foster public interest in forestry throughout the Empire;

(c) To secure general recognition of the importance of forest management;

(d) To collect and circulate information as to exsiting forest conditions, and as to the future timber requirements of the Empire;

(e) To provide a clearing house for information and a centre for co-operation;

(f) To organize meetings for the discussion of the problems connected with the growth of timber, and its utilization.

SAY "EDDY'S"

Next time you are right out of Matches ask your dealer for a box of **Eddy's.**

Then you'll get good matches—real matches, safe, sure lights—guaranteed good by the name Eddy on the box.

There are 30 to 40 different brands of Eddy's nearly all of which are chemically self-extinguishing—they go out completely when blown out. **No dangerouh afterglow.**

Ask your dealer also about **Eddy's Indurated Fibreware**—the light, clean, durable utensils that never bulge, warp or leak.

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HULL, CANADA

An Empire Body

Steps have now been taken towards the establishment and incorporation by Royal Charter of the Empire Forestry Association; its affairs will be directed by a Governing Council and an Executive Committee, the latter deriving its powers, by delegation, from the former, and to be composed of representatives of the United Kingdom, Australia, Canada, Newfoundland, New Zealand, South Africa, India, and the Crown Colonies and Protectorates, and of the trade interests of those areas. The Chairman of the Governing Council and the Executive Committee is Viscount Novar, and the members of the Executive Committee include the Earl of Plymouth, Viscount Milner, Sir John Stirling Maxwell, and Lieut.-Colonel G. L. Courthope, M.P., for the United Kingdom; Mr. H. R. Mackay, for Australia; the Duke of Devonshire and Mr. Robson Black, for Canada; Sir Mayson Beeton, for Newfoundland; Lord Islington, for New Zealand; Earl Buxton, for South Africa; and Sir Claude Hill, K.C.S.I., for India.

Amongst those who have consented to become Vice-Presidents are: H. R. H. Prince Arthur of Connaught, Lord Allenby, Lord Plumer, Lord Ronaldshay, Lord Willingdon, Sir E. D. Maclagan, General Sir H. Smith-Dorrien, Sir S. Harcourt Butler, Sir Charles A. Harris, Mr. Geoffrey Archer, C. M.G., and Mr. Richard J. Wilkinson.

Terms and conditions of membership for individuals, firms and associations can be obtained from the Secretary, 17, Victoria Street, Westminster. The founders of the Empire Forestry Association have received many promises of support from overseas, and are making arrangements to publish a quarterly journal, which it is hoped will be welcomed by those in whose interests the Association has been founded. They appeal with confidence to all who grow or use timber to support this effort to place British forestry on a sounder basis, and to stimullate the production and preservation of timber in all parts of the Empire.

QUEBEC AGENT-GENERAL'S OPINION

From report of meeting of Empire Forestry Association, London, England.)

Remarks of Hon. Mr. Pelletier: "The Canadian Forestry Association is doing excellent work in Canada. Twenty years ago very little was heard of the Canadian body but to-day everyone speaks highly of the work it is doing."

Boys Given Task of Reforesting a State

Louisiana is undertaking an experiment in reforestation which, if it is successful, is likely to be widely imitated. She is making an appeal to the boys to plant forests, and to encourage them a large lumber company is offering prizes for the lads who show the most industry and skill. The appeal is directed especially to the farm boys between the ages of ten and eighteen for it is from the farms that a large part of Louisiana lumber of pine, cypress and hardwoods comes. Last year one farm out of four had a revenue from lumber and the total amounted to $7,000,000. The farmers generally, however, despite the fact that they have found it profitable to sell timber, have not troubled to replant what is cut. The tendency is to cut the timber and then crop the cleared land. This practice does not work well and is wasteful, because land that has grown pine is not fit for cropping for some years after the timber has been cut because of the acids, pine needles and rotting stumps which destroy the fertility of the soil until they have been cleared off or plowed under several times.

Millions of Idle Acres

If, however, these lands were immediately planted again they would become an asset instead of a liability, and since there are

FISHERMEN AND CAMPERS—

Quick Relief from the many minor accidents and bruises you receive on your vacation is afforded by Minard's Liniment. Put a Bottle in you outfit.

Minard's Liniment Co., Ltd.,
Yarmouth, N.S.
Branch Factory, St. John'c,
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PATENTS
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about 8,000,000 acres of cut-over pine lands in Louisiana it is plain that the state is losing an immense fortune because of the non-productiveness of these great tracts. There is another 4,000,000 acres of land that once bore cypress and hardwoods that is idle making a total in all of 12,000,000 idle acres. The immediate plan of the state is to replant 4,000,000 acres, and to endeavor to counterbalance the annual cut of 250,000 or 300,000, which is now going on. The appeal to the boys was made in December, and by the next month not fewer than 5,000 had enrolled themselves in the clubs. By the end of this year it is expected that there will be 25,000 of them at work.

Five Acres for One Boy

How much will be planted by this force in a year is a matter of conjecture, but it has been estimated that a boy can plant and look after five acres of young forest in his spare hours and still have time for his usual work and recreation. If each boy plants three acres and looks after the young crop until it does not require further attentiion there will be a gain for the boys, the state and the lumber companies of 75,000 acres a year. The boys will be instructed in the planting and care of seeds and seedlings and will be taught all about trees so that there will be the further advantage to the lumber companies of having not only a growing crop of lumber, but a growing crop of lumbermen, who when they take farms for themselves are likely to continue their attention to trees both as a source of profit and of interest.

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Instructing the Boys

An article on this subject in Popular Mechanic says: "The State has placed a forester who formerly was connected with the Public schools, and thus is familiar with the American boy, and methods of teaching him, in charge of the reforestation plan, and has issued 5,000 copies of a bulletin describing in simple language the trees best adapted to the land in various parts of the State; how to tell the ages of standing trees, and how to plant, care for and protect natural or artificial forests with the best financial results. Special attention is being paid to the value of standing timber, which has been sold by Louisiana farmers with reckless prodigality in the past at from one-tenth to one-half of its real value. Little difficulty will be experienced in obtaining the use of farm lands from the farmers since an arrangement is to be made with the State Government whereby cretain reductions in taxation will be given those owners of agricultural lands who allow the boys to reforest parts of such areas."

Needn't Wait a Lifetime

As part of this campaign farmers are being taught that timber suitable for such farm purposes as fence building, the construction of corn cribs and other farm premises can be produced at practically no cost to them. Those who can afford to wait until the newly planted trees are full grown will of course, reap a rich harvest, but others will find themselves in possession of most all the timber they are likely to use about the farm by culling their wood lots after ten years. They will also be provided with fuel at no other expense than the time taken to fell and cut up a tree. In the meantime the other trees continue to grow into money. The boys' reforestation club is a natural development of the cattle, pig, corn and other agricultural clubs for boys which are scattered all over the United States and Canada and which received a special impetus during the Great War.

A New Use for Willow

The willows, which in immense number either fringe or cover the islands and bottom lands along the Upper Mississippi, have been found at last to serve a real commercial purpose instead of just greening and festooning the landscape and supplying hte Indian women with the material for basketry. The Government in its $20,000,000 undertaking to make a 6-foot channel at lowest water stage on the Mississippi from St. Louis to St. Paul, has turned willow lumberman and is cutting thousands of these willows annually.

The channel deepening is largely accomplished by the building of "wing dams" out from shore. These throw the water into one main groove, increasing the rate of the current, which in turn scours out and deepens the channel. Besides the wing dams, in order to prevent the waters from spreading into secondary channels, occasionally a "closing dam" is built across the neck of a slough or bayou, entirely cutting it off from the river.

To build these dams Uncle Sam has many crews at work chopping down willows on the islands. They pay the owners a small sum, and in most cases the parties owing the lands are glad to get rid of the willows, as it gives more chance for the trees to grow. The willows are loaded on big flat barges and towed to the place where the dam is to be built. They are tied into bundles and then dropped from the barges into the river at the point of dam building. After a mattress of them has been laid in the water it is loaded down with rock to sink it to the bottom of the river. Then a second willow mattress is built which in turn is sunk. So the building goes on until the dam is of desired height. The barges of willow and rock are moved up and down the length of the dam by electric power furnished from a floating power house, which with the barges forms the equipment of a dam building crew.

Where Cork Comes From

Cork is the outer layer of the bark of an evergreen oak. Although the tree grows over a wide territory, the commercial production of cork is restricted to a comparatively small area bordering the western Mediterranean Sea, between the 34th and 45th degrees of latitude, North.

The Iberian peninsula is the great centre of cork production and produces nearly two-thirds the world's supply of cork. It also grows widely in southern France, Italy, Corsica, Sardinia, Morocco, Algiers, and Tunis, and, to a limited extent, in Greece, the Dalmatian Coast, Tripoli, and Asia Minor. Portugal probably produces more cork than any other country, but Spain is regarded as the centre of the cork industry because it imports large quantities from Portugal and re-exports it together with the Spanish product in the various manufactured forms. The Tagus River Valley in Portugal and the provinces of Catalonia, Andalusia and Estremadura in Spain are the great sources of the world's cork supply.

There are 400,000 acres of cork forest in France, 818,000 acres in Portugal, about 850,000 acres in Spain, 1,000,000 acres in Algeria; and 200,000 to 250,000 acres in Tunis. The total area of cork oak forests is estimated to be between 4,000,000 and 5,000,000 acres. The richest and most productive forests are in Portugal and Spain.

Cork has played an important part in civilization since the days of the ancient Greeks of the 4th century B. C. and the Roman Empire, for it is mentioned by Horace and Pliny as well as by Plutarch and an early Greek writer. Even in those early days cork was used both for bottle stoppers and for buoys for fishermen's nets. The introduction of glass bottles in the 15th century gave a great impetus to the industry and the importance of cork gradually increased until modern times.

In 1914 America imported over $6,400,000 worth of cork in its various forms, and even in 1918 the value was over $5,000,000 in spite of the lack of ocean tonnage. In 1916 Spain exported cork and cork products to the value of about $6,900,000. The annual production of cork from all sources is estimated to be between 50,000 and 60,000 tons.

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King Spruce

It is not generally appreciated that the value of the annual production of spruce lumber and pulpwood in Canada exceeds that of nickel, silver, gold, copper and lead combined. In 1919, the value of the spruce lumber was approximately $44,000,000 and of pulpwood $28,000,000, or three times the value of either the Douglas fir or white pine production.

This is probably due, at least in part, to the fact that spruce is a dual-purpose wood, being valuable for both lumber and pulp. The light colour, long fibres and easy pulping qualities make it the most valuable wood for the manufacture of paper. Spruce was at one time considered the only wood suitable for the manufacture of newsprint. Though the increasing difficulty of securing sufficient spruce to meet the demand has led to the use of other woods, chiefly balsam and hemlock, in combination with spruce, spruce still comprises over 70 per cent of the wood used by the pulp and paper mills in Canada. As lumber, it is white, soft, light and easily workable, possessing a maximum of strength for its weight, so that it is in demand for light construction and interioir finish. The absence of a very distinct grain precludes its general use in a natural finish, but it is largely used in place of pine where it is to be painted.

There are five species of spruce in Canada. Red spruce is confined to the Maritime Provinces and the eastern part of Quebec. White spruce and black spruce extend from the Atlantic coast to Alaska and as far north as the mouth of the Mackenzie river. In the southeastern part of its range, the black spruce is usually confined to wet or swampy sites, where it grows slowly and to a small size. In the northwest, it is found on better sites and is a better tree. White spruce is, however, the most important eastern species of spruce.

Sitka spruce is confined to the Pacific coastal region. It attains very large sizes, up to 8 to 12 feet in diameter and 160 to 180 feet in height. During the war, it was framework of air-craft, and 26,000,000 found that Sitka spruce-wood was the best in the world for the manufacture of the board feet of the finest quality was supplied by British Columbia to the Imperial Government for this purpose.

Engelmann spruce is plentiful in the inland, mountainous region in the southern half of British Columbia. It is also a splendid tree, but does not attain the gigantic sizes of the coastal species.

All of the spruces reproduce well under proper conditions. They are all tolerant of shade, which enables them to reproduce and remain alive even under comparatively dense stands. They do not thrive under such conditions, however, and, unless relieved of the oppression in time, their recuperative powers will be weakened. If given a chance, all of the species, except possibly black spruce, will make a rapid growth, and will afford perhaps a better return in a forest managed for sustained yield than most other kinds of trees. This is especially true where small sizes can be utilized, as in the pulp industry.

Although reliable information is not available as to the amount of spruce in Canada, it is estimated that about one-third of the standing timber is spruce. There is, perhaps, between 100 and 150 billion board feet suitable for the manufacture of lumber, and, in addition, between 350 and 400 million cords of spruce pulpwood. A very considerable amount of this, possibly one-half, is not commercially accessible under the present conditions of market and transportation.

The annual cut of spruce is a little over two billion board feet. To this must be added the annual destruction by fire and by insects, which during the last two decades, has far exceeded the amount used. The depletion of the pulpwood resources of the eastern United States has already created, and will continue to cause, an ever-increasing demand on hte spruce forests of Eastern Canada.

Unless measures are taken to reduce the waste in logging, to check forest fires, and to provide for the development of new crops, the available spruce forests of Eastern Canada, at least, will be within sight of exhaustion inside of fifty years.

(Commission of Conservation)

A Leading Western Editor on the Canadian Forestry Association

From the Medicine Hat News.

The Canadian Forestry Association is now on its annual hunt for new and old members to sustain it in its work for the general benefit of Canada and Canadians. The Evening Times desires to lend its encouragement for two reasons: First, because the work of the association is of the greatest importance to our Dominion as a whole; and second, because it is of the utmost consequence to the prairie people.

The type of citizen to which the Forestry Association makes its appeal is the type to whom most appeals come, — the fellow who pays his taxes, "and then some," the fellow who goes the second mile and parts with his cloak also, in short, the citizen who responds to worthy appeals for serving the true and permanent interests of society. It costs $2.00 for membership, which includes a yearly subscription to the Illustrated Forestry Magazine, worth more than the amount. But hundreds of citizens express their interest and citizenship in the form of $5.00 annual subscriptions, which help along the educational enterprise.

Eighty per cent. of Canada is destined for the growing of forest crops and is valueless for farming. On two-thirds of this vast area we have sacrificed the forest assets through unrestricted fire. One million square miles of

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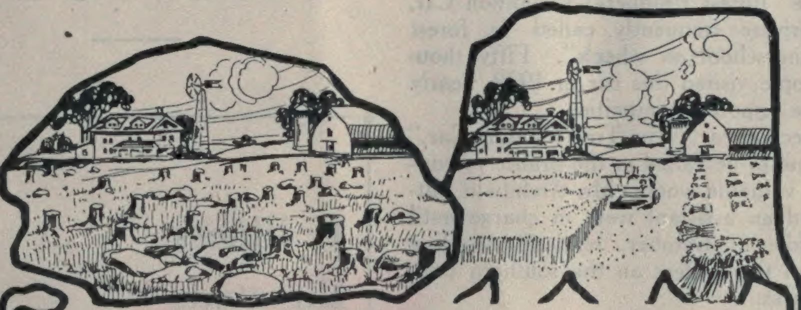

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timber lands have been destroyed by flame as compared with 100,000 miles cleared (usefully) by the axe of the logger.

Dividends to Canada

The only interest served by the Canadian Forestry Association is the public interest. For twenty years it has brought dividends to the Canadian people — none to itself. It is not owned or controlled by any government or commercial interest. The Board of 56 directors represents the whole of Canada. Because these and 12,000 other men stayed with the ship through the campaigns of 1920, the association was able to send out seven skilled field workers and four asssitants to organize the educational side of forest protection in districts where the fire menace is most severe.

These men held nearly 400 public meetings during the summer season; each meeting complete with educational motion pictures and popular addresses on the method of preserving Canada's great forest heritage.

Then, to hundreds of communities there went the "Forest Products" Exhibition Car, an enterprise frequently called "a forest protection school on wheels". Fifty thousand people visited this car in 1920, nearly all in the remote communities.

The second car, "The Tree Planting Car," as it came to be called in the prairie provinces, did valuable work. Mr. Archibald Mitchell and an assistant were in charge until the middle of October, rendering sterling service to the settlers on the southern treeless prairies.

What we have mentioned were two or three out of a score of educational enterprises for which the association is responsible.

And then the Illustrated Forestry Magazine. It is wholly for service, not for profit. Subscribers say: "The magazine grows better every month." Nothing techincal or local in its pages! And plenty of good pictures.

Why ? and its Answer

Occasionally a member writes in: "Should not your work be performed by governments? Why trespass upon a government function? "

This is the answer: No government is in the unique position of the Canadian Forestry Association for creating a strong foundation of public conviction on forestry and kindred public problems. Our complete independence of governments and commercial bodies is our supreme asset. It renders our scope universal; it removes us from partisan limitations. It assures popular confidence and favor in all places under all circumstances.

No government now performs, nor desires to perform, the educational service of the Canadian Forestry Association. All governments, however, heartily endorse our aims and methods and several of them grant us financial aid.

So with the lumber and pulp and paper and other private companies! Upon their annual grants we are able to base an educational programme of mighty benefit to the future of our Dominion.

There is meaning in this: Seventy-five per cent. of the members of the Canadian Forestry Association own not a stick of timber or a share in lumber or paper mill. They insist upon remaining members year after year because — their membership carries out their definition of good citizenship.

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threatens
a breach—
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